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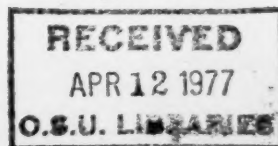
WATER RESOURCES ABSTRACTS

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VOLUME 10, NUMBER 7
APRIL 1, 1977

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology,
U.S. Department of the Interior



VOLUME 10, NUMBER 7
APRIL 1, 1977

W77-03076 -- W77-03600

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Depart-

ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

SELECTED WATER RESOURCES ABSTRACTS

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.



VOLUME 10 NUMBER 1
APRIL 1 1978

WATER RESOURCES

WATER RESOURCES ABSTRACTS
VOLUME 10 NUMBER 1
APRIL 1 1978

The Secretary of the U.S. Department of the Interior is pleased to announce the publication of this periodical. It is a publication of the U.S. Department of the Interior, Office of Water Resources, and is published by the U.S. Government Printing Office. The periodical is published by the U.S. Government Printing Office, Washington, D.C. 20540.

FOREWORD

Selecting Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus**. Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstract-

ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES

Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION

Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

CORRELATION ANALYSIS OF HYDROMETEOROLOGICAL DATA. Central and Southern Florida Flood Control District, West Palm Beach. Environmental Engineering.

A. N. Shahane, D. Thomas, and P. Bock. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY10, Proceedings Paper 12484, p 1561-1572, October 1976. 2 fig, 7 tab, 10 ref, 2 append.

Descriptors: *Correlation analysis, *Statistical methods, Precipitation(Atmospheric), Drainage area, Evapotranspiration, Fourier analysis, Meteoric water, Rainfall, Runoff, Time series analysis, Meteorology, Statistics, Water vapor, Watersheds(Basins).
Identifiers: *Statistical analysis, Variance, Vapor transport, Terrestrial storage.

Mean monthly time series of precipitation, runoff, atmospheric water vapor transport, terrestrial storage, and evapotranspiration for watersheds distributed over the entire continental United States were analyzed by harmonic analysis to compute Fourier coefficients (with first four harmonics) and explained variances. In addition, linear cross-correlation coefficients for 10 combinations of the five time series were computed. The observed spatial variation of these parameters was thought to be useful to those faced with the formulation of statistical models for simulation and prediction applications. (Roberts-ISWS)
W77-03086

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 5, HYPOTHETICAL FLOODS. Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B.
W77-03104

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 6, WATER SURFACE PROFILES. Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B.
W77-03105

A THREE-DIMENSIONAL FINITE ELEMENT GROUND WATER MODEL. California Univ., Davis. Water Science and Engineering Section.
For primary bibliographic entry see Field 2F.
W77-03109

THE UNIT HYDROGRAPH: A SATISFACTORY MODEL OF WATERSHED RESPONSE. Massey Univ., Palmerston North (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 4D.
W77-03126

SEASONAL DEMARCATION IN PENNSYLVANIA FOR HYDROLOGICAL USE. Massey Univ., Palmerston North (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W77-03127

TWO DIMENSIONAL BOTTOM WITHDRAWAL FROM A DENSITY-STRATIFIED RESERVOIR. Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.

W77-03129

A PERTURBATION APPROACH TO TWO-DIMENSIONAL BOTTOM WITHDRAWAL FROM A DENSITY-STRATIFIED RESERVOIR. Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-03151

NORMAL-MODE ANALYSIS OF THE STRUCTURE OF BASEFLOW RECESSION CURVES. Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W77-03313

LOW FLOW MODELING IN SMALL STEEP WATERSHEDS. Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W77-03316

WET AND DRY PERIODS OF ANNUAL FLOW SERIES. Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power; and Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-03319

2B. Precipitation

RAINFALL IN THE SEYCHELLES 1941 TO 1970. D. Aspin. Weather, Vol. 31, No. 2, p 47-56, February 1976. 6 fig, 1 tab, 10 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Indian Ocean, Islands, Climates, Droughts, Wet seasons, Monthly, Annual, Climatic data, Measurement.
Identifiers: *Seychelles, *Mahe, Moving means, Intertropical Convergence Zone, Standard deviation, Climatic change.

The trend of rainfall by months and years for Long Pier, Victoria, in the Seychelles Group of the Indian Ocean, was studied. It was found that there was only a single monthly maximum (January) and single monthly minimum (July) even though the Intertropical Convergence Zone passes over the island twice each year. It was further found that there has been an increase in annual rainfall from 1940 to 1970 with about the same reliability as mid-latitude stations. Ten-year moving means for each month show that all months except June had an increase in rainfall over the 30-year period. The significance of this rainfall increase in the Seychelles when compared with the decrease in rainfall on the southern margins of the Sahara and the Indian sub-continent was discussed. (Jones-ISWS)
W77-03096

RELATION BETWEEN ATMOSPHERIC POLLUTION, PRECIPITATION, AND STREAM-WATER QUALITY NEAR A LARGE URBAN-INDUSTRIAL COMPLEX. Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5B.
W77-03097

ELECTRONIC SENSOR FOR LOW-TO-MEDIUM WINDSPEEDS. Agricultural Research Service, Yakima, Wash.
For primary bibliographic entry see Field 7B.
W77-03099

A REVIEW OF HAIL-MEASURING INSTRUMENTS. Illinois State Water Survey, Urbana.
N. G. Towery, S. A. Changnon, Jr., and G. M. Morgan, Jr.
Bulletin American Meteorological Society, Vol. 57, No. 9, p 1132-1140, September 1976. 7 fig, 1 tab, 38 ref. NSF GI-37859, ERP75-09930.

Descriptors: *Hail, *Instrumentation, *Measurement, Equipment, Cost, Remote sensing, Radar, Precipitation(Atmospheric), Storms, Ice, Rain, Meteorology.
Identifiers: *Hail sensors, Hailpads, Hail recorders.

The characteristics of commonly used surface hail instruments were reviewed and instruments evaluated. The instruments evaluated were classified into two major categories: integrating and recording. The integrating sensors are relatively inexpensive and provide certain useful hail data. The recording sensors are much more expensive but provide more useful data, including time of hail. The review included the principles of operation, types of data obtained, operational advantages and disadvantages, and approximate cost of each type of instrument. (Sims-ISWS)
W77-03101

GUIDELINES FOR FLASH FLOOD AND SMALL TRIBUTARY FLOOD PREDICTION. National Weather Service, Kansas City, Mo. Central Region.
For primary bibliographic entry see Field 4A.
W77-03114

SEASONAL DEMARCATION IN PENNSYLVANIA FOR HYDROLOGICAL USE. Massey Univ., Palmerston North (New Zealand). Dept. of Geography.
R. G. Heerdegen.
Water Resources Bulletin, Vol 10, No 4, August, 1974, p. 813-817. 6 fig, 3 ref. OWRT B-041-PA(5), 14-31-0001-3635.

Descriptors: *Pennsylvania, *Dormancy, Weather data, Hydrologic data, *Seasonal.
Identifiers: *Growing season, *Seasons, *Dormant season, Climatological data, Hydrologic use.

A study was made of the length of the growing and dormant season in Pennsylvania by isoline interpolation from climatological data. Maps of the beginning and ending of the growing and dormant seasons, length of growing season and ratio of growing to dormant season are included. It is suggested that the growing season is a good index of seasonality and that the length of the growing season and the ratio of length of growing to dormant season are good parameters for hydrologic use. It could be concluded that no single date can be assigned to the start of the growing season (six weeks difference State-wide for Summer and four weeks difference for Winter), that no even length can be assigned to the seasons (growing season ranging from four to six months in length) and that four distinct seasons do not exist, but rather there are two major seasons, growing and dormant, between which are short transition periods. (Sink-Penn State)
W77-03127

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, EXECUTIVE SUMMARY. M and B Associates, San Ramon, Calif.
For primary bibliographic entry see Field 3B.
W77-03212

Field 2—WATER CYCLE

Group 2B—Precipitation

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, VOLUME I - METEOROLOGY AND HYDROLOGY OF THE NORTHERN SIERRA NEVADA, FINAL REPORT.

M and B Associates, San Ramon, Calif.
For primary bibliographic entry see Field 3B.
W77-03213

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, VOLUME II - PHYSICAL AND STATISTICAL DESIGN, FINAL REPORT.

M and B Associates, San Ramon, Calif.
For primary bibliographic entry see Field 3B.
W77-03214

PREPARATION OF HYDRODYNAMICAL-NUMERICAL AND 3-PARAMETER SMALL-MESH ATMOSPHERIC MODELS FOR COASTAL WATERS IN THE GULF OF ALASKA,

Naval Environmental Prediction Research Facility, Monterey, Calif.
For primary bibliographic entry see Field 5B.
W77-03235

MARINE CLIMATOLOGY OF THE GULF OF ALASKA AND THE BERING AND BEAUFORT SEAS,

Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
For primary bibliographic entry see Field 5B.
W77-03239

MARINE CLIMATOLOGY OF THE GULF OF ALASKA AND THE BERING AND BEAUFORT SEAS. PART III. CLIMATIC ATLASES,

Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
For primary bibliographic entry see Field 5B.
W77-03240

NEAR-SHORE ATMOSPHERIC MODIFICATION,

National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03242

THE COMPOSITION OF RAINWATER AT TWO SITES NEAR TOWNSVILLE, QLD. (AUSTRALIA),

Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Div. of Soils.
For primary bibliographic entry see Field 2K.
W77-03279

ELECTROSTATIC INDUCTION PARAMETERS TO ATTAIN MAXIMUM SPRAY CHARGE TO CLEAR FOG,

Naval Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 3B.
W77-03299

ARTIFICIAL MODIFICATION OF ATMOSPHERIC PROCESSES,

For primary bibliographic entry see Field 3B.
W77-03303

PRECIPITATION ON THE ARAL SEA SURFACE, (IN RUSSIAN),

A. E. Asarin.
Probl Osvoeniya Pustyn' 1, p 58-62, 1975.

Descriptors: *Precipitation(Atmospheric), *Water balance, Data collections, Saline water, Lakes.
Identifiers: *Aral Sea, *USSR.

To calculate water balance, the mean arithmetic values of the total annual precipitation (recorded from all the stations on the Aral Sea (USSR)) were taken as the computed values of annual precipitation rate of the Aral Sea surface from 1926-1970.--Copyright 1976, Biological Abstracts, Inc.
W77-03592

2C. Snow, Ice, and Frost

RADIO-ECHO LAYERS AND THE RECENT STABILITY OF THE WEST ANTARCTIC ICE SHEET,

Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies and Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
I. M. Whillans.
Nature, Vol. 264, No. 5582, p 152-155, November 11, 1976. 4 fig, 38 ref.

Descriptors: *Remote sensing, *Model studies, *Ice cover, *Antarctic, Aircraft, Radar, Surveys, Stability, Ice, Cold regions, Glaciers, Glaciology.
Identifiers: *Ice sheets.

A new method for studying polar ice sheets confirmed the generally accepted concepts of ice sheet flow and found that a region near the ice crest of the West Antarctic ice sheet has been stable for about 30,000 yr. During the austral summer 1974-1975, radio-echo sounding flights were conducted in the Antarctic. Equipment was flown in an LC-130 (Hercules) aircraft by the US Navy as part of the United States Antarctic Research Program. A very simple model for the flow of the ice sheet was used. The model results and the radio-echo results are independent. The model was developed before the radio sounding flights were conducted. The simplest and most plausible explanation for the similarity of the calculated isochrons and the radio-echo layering is that the mass-balance, velocity field, and shape of the central portion of the ice sheet have not changed significantly during approximately the past 30,000 years. (Sims-ISWS)
W77-03100

A REVIEW OF HAIL-MEASURING INSTRUMENTS,

Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W77-03101

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, EXECUTIVE SUMMARY,

M and B Associates, San Ramon, Calif.
For primary bibliographic entry see Field 3B.
W77-03212

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, VOLUME III - OPERATIONAL DESIGN, FINAL REPORT.

M and B Associates, San Ramon, Calif.
For primary bibliographic entry see Field 3B.
W77-03215

DELINEATION AND ENGINEERING CHARACTERISTICS OF PERMAFROST BENEATH THE BEAUFORT SEA,

Cold Regions Research and Engineering Lab., Hanover, N. H.
P. V. Sellman, R. Berg, J. Brown, S. Blouin, and E. Chamberlain.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports

for the Year Ending March 1976, Vol 12. Geology, p 391-408, April 1976. 1 fig, 55 ref, 2 append. 01-50-22-2313.

Descriptors: *Alaska, *Permafrost, *Cold regions, *Baseline studies, *Resources development, *Environmental effects, Maps, Bibliographies, Sampling.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Beaufort Sea.

The report was prepared as the mobilization phase for offshore drilling at Prudhoe Bay was being completed. The entire effort to date has involved the planning and mobilization of a drilling and sampling program for the purpose of gathering data on the physical, chemical and thermal properties of permafrost beneath the Beaufort Sea. Therefore, the report deals primarily with activities leading up to the actual data acquisition phase. A preliminary bibliography on subsea permafrost from Soviet literature is included. (Sinha-OEIS)
W77-03247

OFFSHORE PERMAFROST STUDIES, BEAUFORT SEA,

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03249

MARINE ENVIRONMENTAL PROBLEMS IN THE ICE COVERED BEAUFORT SEA SHELF AND COASTAL REGIONS,

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03250

DISTRIBUTION AND CHARACTER OF ICINGS IN NORTHEASTERN ALASKA,

Geological Survey, Menlo Park, Calif.
D. Harden, P. Barnes, and E. Reimnitz.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 600-625, April 1976. 6 fig, 18 ref.

Descriptors: *Alaska, *Permafrost, *Resources development, *Baseline studies, *Environmental effects, *Water pollution, Ice, Organic compounds.

Identifiers: *Outer Continental Shelf, *River icings, Oil exploration, Oil development, North Slope, Satellite imagery, Braided channels.

An examination of the distribution of river icings seen in ERTS-1 satellite imagery and high- and low-altitude aerial photography of Alaska's North Slope indicates these features are numerous and widespread east of the Colville River and rare to the west. Where icings occur, stream channels are wide and often form braided channels. Their distribution can be related to changes in stream gradient and to the occurrence of springs. Large icings, such as on the Kongakut River, often remain through the summer melt season to form the nucleus of icings in the succeeding winter. Major icings also are likely to have a profound influence on the nature of permafrost. The map of river icings may serve as a guide to the occurrence year-round flowing water, a sparse commodity in the area. (Sinha-OEIS)
W77-03252

BEAUFORT SEACOAST PERMAFROST STUDIES,

Alaska Univ., College. Geophysical Inst.
J. C. Rogers.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 257-283, April 1976. 4 fig, 11 ref, append. 03-5-022-55.

Descriptors: *Alaska, *Permafrost, *Oil pollution, *Water pollution, *Baseline studies, *Resources development, *Environmental effects, Coasts, Geophysics.
Identifiers: *Outer Continental Shelf, *Seismic refraction, *Offshore permafrost, Petroleum resources, Oil exploration, Oil development, *Beaufort Sea, Ocean bottom.

The known oil reserves along the Beaufort Seacoast coupled with a national need to develop these resources have focused increased attention on the distribution and character of permafrost in that area. Results of work performed at Prudhoe Bay and Pt. Barrow, Alaska during the 1975 summer field season are reported. A high velocity refractor, characteristics of sub-bottom permafrost, was located in Prudhoe Bay near the shore and followed a distance of 1.4 km offshore. The surface of the layer, which dips downward in the offshore direction, ranges in depth from 12 to 20 meters to about 27 to 35 meters. The first depth estimates correspond to a distance of approximately 400 m from shore while the latter correspond to a distance of 1.4 m from shore. The average slope of the permafrost surface is about 0.8 deg, a figure that is in agreement with the results of drilling into the bottom material by Harrison and Osterkamp of the University of Alaska. However, local variations in the surface slope appear to be large, perhaps as much as 10 degrees. Refraction lines in Elson Lagoon near Pt. Barrow did not indicate the presence of ice bonded permafrost within the depth capability of the equipment used (about 30 meters).
 W77-03262

THE INTERACTION OF OIL WITH SEA ICE IN THE ARCTIC OCEAN,

Washington Univ., Seattle. Dept. of Oceanography.
 For primary bibliographic entry see Field 5C.
 W77-03267

DYNAMICS OF NEAR-SHORE ICE,

Cold Regions Research and Engineering Lab., Hanover, N.H.
 W. F. Weeks, and A. Kovacs.
 In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 9-50, April 1976. 16 fig, 44 ref, append. 01-3-022-2313.

Descriptors: *Alaska, *Sea ice, *Baseline studies, *Resources development, *Environmental effects, *Hazards, Water pollution, Oil spills, Oil pollution, Pipelines, Cold regions.
Identifiers: *Outer Continental Shelf, Oil development, Petroleum resources, Near-shore ice, Fast ice, Pack ice, Engineering problems, Beaufort Sea, Chukchi Sea.

The purpose of this project is to measure the motions of both the fast ice and the near shore pack ice to see if the motions of the latter can be understood and used to predict the motions of the former. While these measurements are being made a number of other studies will be undertaken on the nature of near shore sea ice (ice structure, ice thickness, bottom scoring, ridge characteristics, grounded ice features). Work is also underway to characterize the variations in near shore pressure ridging by the use of laser profilometry and SLAR imagery. A knowledge of the motion deformation and physical characteristics of both the near-shore pack ice and the fast ice is essential to adequately designing and estimating the hazards associated with a variety of engineering options that may be considered for offshore operations in the near coastal areas of the Beaufort and Chukchi Seas (e.g. construction of gravel islands, structural platforms, causeways, reinforced ice platforms, buried pipelines, or the utilization of the ice sheet itself to carry large, longterm loads). (Sinha-OEIS)
 W77-03268

DYNAMICS OF NEAR-SHORE ICE (DATA BUOYS),

Washington Univ., Seattle. Dept. of Atmospheric Sciences.
 N. Untersteiner.
 In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 51-57, April 1976. 1 fig. 03-5-022-67.

Descriptors: *Alaska, *Arctic Ocean, *Sea ice, *Meteorologic data, *Baseline studies, *Resources development, *Hazards, Buoys, Measurement.
Identifiers: *Outer Continental Shelf, *Data buoys, *Oceanographic data, *Atmospheric data, *Petroleum resources, *Oil development, Near-shore ice, Fast ice, Data acquisitions, Arctic Ice Dynamics Joint Experiment(AIDJEX), Beaufort Sea, Chukchi Sea.

Twenty ice buoys are to be deployed to gather data on ice movement and oceanographic and atmospheric conditions in the near-shore areas of the Beaufort and Chukchi Seas of the Arctic Ocean. The buoy deployments are to be accomplished in conjunction with field work being conducted by the Arctic Ice Dynamics Joint Experiment (AIDJEX). Four buoys with oceanographic and meteorological sensors were deployed along the continental shelf break in November, 1975, by NOAA chartered helicopter from Deadhorse, Alaska, and the AIDJEX main ice station in the Beaufort Sea, and eight tracking-only buoys were parachuted from NOAA chartered aircraft in December. Data from the buoys are being received by transmission through the NIMBUS-6 satellite and placed in the AIDJEX Data Bank. (Sinha-OEIS)
 W77-03269

STUDY OF CLIMATIC EFFECTS ON FAST ICE EXTENT AND ITS SEASONAL DECAY ALONG THE BEAUFORT SEA COAST,

Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
 R. G. Barry.
 In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 58-115, April 1976. 9 fig, 5 tab, 7 ref, 4 append. 03-5-022-91.

Descriptors: *Alaska, *Sea ice, *Baseline studies, *Resources development, *Environmental effects, Hazards, Data collections, Cold regions, Water pollution, Seasonal.
Identifiers: *Outer Continental Shelf, *Fast ice, Climatic effects, Oil exploration, Oil development, Petroleum resources, *Beaufort Sea, Synoptic meteorology.

The primary objective of this study was to assess the role of climatic factors in determining the extent and seasonal decay of fast ice along the Beaufort Sea coast. Particular attention was given to synoptic meteorological events during critical phases of the seasonal cycle. Surface morphological categories have been classified. The scheme is intended as the basis for linking satellite-observed surface changes to climatic (and other) factors. Working maps of ice features in the Prudhoe Bay sector during summer 1974 have been compiled. Maps of grey scale information from 1975 LANDSAT frames between 145 and 151 deg W longitude have been prepared. Fifteen representative sample areas of approximately 16 sq. km. each across the mapped area were chosen in an attempt to evaluate the progression of surface reflected radiance through the melt season. The winds indices have been determined for both along-shore and offshore components at Barrow and Barter Island for all months from 1969 to August 1974, but preliminary analysis has concentrated on the winter months. (Sinha-OEIS)
 W77-03270

MECHANICS OF ORIGIN OF PRESSURE RIDGES, SHEAR RIDGES AND HUMMOCK FIELDS IN LANDFAST ICE,
 Alaska Univ., College. Geophysical Inst.
 For primary bibliographic entry see Field 2L.
 W77-03271

MORPHOLOGY OF BERING NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING,

Alaska Univ., College. OCS Coordination Office.
 W. J. Stringer.
 In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 155-250, April 1976. numerous fig, 5 ref. 03-5-022-55.

Descriptors: *Alaska, *Sea ice, *Offshore platforms, *Resources development, *Environmental effects, *Hazards, *Baseline data, Remote sensing, Data collections, Cold regions, Water pollution, Oil spills, Oil pollution.
Identifiers: *Outer Continental Shelf, Petroleum resources, Oil exploration, Oil development, *Bering Sea, Ice conditions, Morphology.

The objective of this study was to develop a comprehensive morphology of ice conditions in the near shore areas of the Bering Sea with special emphasis given to ice conditions which might be hazardous to offshore petroleum exploration and development. The preliminary conclusions are that, unlike ice conditions along the Beaufort coast, ice conditions along the Bering coast are highly variable. Dynamic ice events are possible in the near shore areas during the entire ice season except for the most highly protected bays and inlets. The nature of these events is highly dependent on location and meteorological conditions. The major implication with respect to OCS oil and gas development is that except for a few highly localized areas, it is not possible to depend on a stable sheet of ice from which to conduct exploration and other petroleum related activities. It would follow that all activities including exploration, platform construction, etc would have to be performed during the ice-free season. (Sinha-OEIS)
 W77-03272

MORPHOLOGY OF BEAUFORT NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING,

Alaska Univ., College. OCS Coordination Office.
 W. J. Stringer.
 In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 251-311, April 1976. numerous fig, 5 ref. 03-5-022-55.

Descriptors: *Alaska, *Sea ice, *Resources development, *Baseline studies, *Environmental effects, *Offshore platforms, *Hazards, Remote sensing, Data collections, Cold regions, Water pollution, Oil spills, Oil pollution.
Identifiers: *Outer Continental Shelf, Petroleum resources, Oil exploration, Oil development, *Beaufort Sea, Ice conditions, Morphology.

The objective of this study was to develop a comprehensive morphology of ice conditions in the near-shore areas of the Beaufort Sea with special emphasis given to ice conditions which might be hazardous to offshore petroleum exploration and development. The preliminary conclusions are that within a certain range of variability, ice conditions along the Beaufort coast are predictable: for several months a great deal of reliability can be placed on the existence of a stable sheet of ice extending to roughly the location of the 10-fathom contour. The precise location of the stable ice boundary will be determined from the morphology being developed. Beyond this stable ice boundary, dynamic ice events can occur at any time depending largely on meteorological conditions. The im-

Field 2—WATER CYCLE

Group 2C—Snow, Ice, and Frost

lications to OCS oil and gas development are that within the stable ice boundary, for several months of the year, ice conditions are favorable to the use of the ice surface for exploration and other activities. Beyond this boundary conditions become unreliable or predictably hazardous. (Sinha-OEIS) W77-03273

EXPERIMENTAL MEASUREMENTS OF SEA ICE FAILURE STRESSES NEAR GROUNDED STRUCTURES,

Alaska Univ., College. OCS Coordination Office. R. D. Nelson, and W. M. Sackinger. In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 313-331, April 1976. 3 fig, 8 ref. 03-5-022-55.

Descriptors: *Alaska, *Sea ice, *Resources development, *Baseline studies, *Environmental effects, *Hazards, *Failure(Mechanics), Telemetry, Water pollution, Oil pollution. Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, Petroleum resources, Grounded structures, Ice sheets, Land fast ice, Pack ice, Offshore structures.

The objectives of this study were to measure, in situ, the stresses generated in a sea ice sheet as it fails in the vicinity of a static obstacle and the rate of approach of the ice sheet during this process. The results of the first experiment support the hypothesis that stresses generated by pack ice impingement on land fast ice are low when the motion is predominantly shearing past land fast ice. This implies that at certain times land fast ice may be a safe location for oil exploration or drilling activities. The radio telemetry system developed for the stress sensors provides a particularly convenient method of stress analysis. (Sinha-OEIS) W77-03274

BEAUFORT SEA, CHUKCHI SEA, BERING STRAIT HISTORICAL BASELINE ICE STUDY,

Alaska Univ., College. Dept. of History. W. R. Hunt, and C. M. Haske. In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 333-385, April 1976. append.

Descriptors: *Alaska, *Sea ice, *Data collections, *Resources development, *Baseline studies, History. Identifiers: *Outer Continental Shelf, *Ice conditions, *Beaufort Sea, Bering Sea, *Chukchi Sea, Petroleum resources.

The objectives of this study were to collect data on the history of ice conditions in the Beaufort and Chukchi Seas, and Bering Strait, to synthesize this data, and to present the results in report and cartographic form. The source materials examined include the field notes of explorers, journals of coastal residents and traders and some whaling journals. The appendix contains the shore observations from the Alaska File of the Revenue Cutter Service from 1867 to 1914. The most significant observation is the documentation of a probable 26-year cycle of severe ice conditions. (Sinha-OEIS) W77-03275

DEVELOPMENT OF HARDWARE AND PROCEDURES FOR IN-SITU MEASUREMENT OF CREEP IN SEA ICE,

Alaska Univ., College. Geophysical Inst. L. H. Shapiro, R. D. Nelson, W. M. Sackinger, and E. R. Hoskins. In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 387-407, April 1976. 13 ref. 03-5-022-55.

Descriptors: *Alaska, *Sea ice, *Resources development, *Baseline studies, Creep, Measurement, Hazards, Environmental effects, Instrumentation. Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, Petroleum resources, Ice conditions, In-situ measurement, Hardware, Strain gauges.

The specific objective of this project was to develop hardware and procedures for the in situ measurement of the creep behavior of sea ice. Any permanent or semi-permanent structures off the Arctic Coast of Alaska must contend with the hazard that sea ice presents to its stability. In order to properly design such installations it is necessary that reliable values of the mechanical properties of the ice be available both for establishing the design of the structure, and for the evaluation of that design by public agencies. In addition, significant savings in cost of construction can be realized if less conservative safety factors can be utilized. The use of steel flatjacks, expanded with nitrogen gas, for loading devices has proved successful in all the tests to date. Similarly, no serious problems have been encountered in the preparation of strain cells although more work is needed, particularly in coarse crystalline ice where the size of the grains may be large enough to distort the strain field in the cell. In addition, there is still a question as to whether small strain gauges will be adequate for testing later in the spring when higher temperatures will permit the strain to become much greater than those encountered to date. However, the basic questions regarding the design of a suitable strain cell appears to have been resolved. (Sinha-OEIS) W77-03276

THE CLASSIFICATION AND GEOMORPHIC IMPLICATIONS OF THAW LAKES ON THE ARCTIC COASTAL PLAIN, ALASKA,

Cold Regions Research and Engineering Lab., Hanover, N.H. Northern Engineering Research Branch. P. V. Sellmann, J. Brown, R. I. Lewellan, H. McKim, and C. Merry.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A021 226, Price codes: A03 in paper copy, A01 in microfiche. Research Report 344, December 1975. 25 p, 11 fig, 1 tab, 30 ref.

Descriptors: *Ice, *Permafrost, *Lakes, *Arctic, *Alaska, Remote sensing, Satellites(Artificial), Classification, Thawing, Cold regions, Geomorphology, Geology. Identifiers: *Thaw lakes, *Arctic Coastal Plains(Alaska), ERTS, Lake morphology.

The lakes of the Arctic Coastal Plain of northern Alaska were classified, based on size, shape, orientation, and distribution, into six lake units and three nonlake units. Regional slope and relief were demonstrated to control lake size. The largest lakes occur on the flattest, northernmost segment of the Coastal Plain. Using ERTS-1 sequential imagery and existing photography and data, lakes were grouped according to three depth ranges, less than 1 m, 1-2 m and greater than 2 m. Deepest lakes have the longest period of summer ice cover. Ice on shallow lakes melts the earliest. Maximum depths of lakes were computed based on ice volume content of the perennially frozen ground (permafrost), and these computations agreed with observed values and ranges. The lake classification and regional ERTS-1 coverage also appear to provide additional information on the limits of late-Pleistocene transgressions on the Coastal Plains. (Sims-ISWS) W77-03296

STRENGTH OF ICE UNDER MULTIAXIAL LOADING, Southwest Research Inst., San Antonio, Tex. J. Lankford, and P. H. Francis.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A018 373, Price codes: A02 in paper copy, A01 in microfiche. Final Report 02-4071, September 1975. 10 p, 3 fig, 1 tab, 5 ref. ARO DAHCO4-75-C-0002.

Descriptors: *Ice, *Strength of materials, *Laboratory tests, Strength, Compressive strength, Failures, Failure(Mechanics), Pressure, Stress, Ice loads, Analytical techniques. Identifiers: *Multiaxial loading, Ice strength.

Strength tests were carried out using hollow, cylindrical specimens of polycrystalline ice, subject to combined axial compression, internal/external pressure. A portion of the failure envelope in principal stress space was mapped out and compared with data of other workers. The results of all available multiaxial tests can be fit by a modified Paul first order criterion. (Sims-ISWS) W77-03301

STRUCTURE OF THE GLACIER CHARLES RABOTS BRE, NORWAY,

Eidgenössische Technische Hochschule, Zurich (Switzerland). Geologisches Institut; and Eidgenössische Technische Hochschule, Zurich (Switzerland). Geographisches Institut. M. J. Hambrey. Geological Society of America Bulletin, Vol. 87, No. 11, p 1629-1637, November 1976. 10 fig, 1 tab, 40 ref.

Descriptors: *Glaciers, *Glaciology, *Surveys, *Geomorphology, Ice, On-site investigations, Ablation, Folds(Geologic), Stratification, Sedimentary structures, Movement, Foreign countries. Identifiers: *Norway, *Charles Rabots Bre glacier, Ice fracture, Secondary structures.

Sedimentary stratification, foliation, and crevasse traces (including those of healed crevasses) are well displayed at the surface of the small, steep glacier Charles Rabots Bre. Two main flow units, cropping out as convex downglacier arcuate systems of stratification, are recognizable, but others, related to the irregular distribution of the accumulation areas, also contribute significantly to the outcrop pattern. Between the flow units and at the margins of the glacier, strong, steeply dipping longitudinal foliation crops out parallel to longitudinally striking stratification. Much of this foliation is believed to form as a result of shearing and recrystallization in the planes of favorably oriented sedimentary layers. The persistence of crevasse traces below the sets of marginal and transverse crevasses in an area of strong ablation indicates that fracture occurs to greater depths in temperate glacier ice than is generally believed. (Humphreys-ISWS) W77-03311

BREAKUP FLOODING AND NUTRIENT SOURCE OF COLVILLE RIVER DELTA DURING 1973,

Louisiana State Univ., Baton Rouge. Coastal Studies Inst. For primary bibliographic entry see Field 5B. W77-03388

2D. Evaporation and Transpiration

COMPUTATION OF THE POTENTIAL EVAPOTRANSPIRATION AND THEIR COMPARISON WITH VALUES OF THE ACTUAL EVAPOTRANSPIRATION OF LYSIMETERS, (IN GERMAN),

Agrarmeteorologische Forschungsanstalt, Brunswick (West Germany). H. Shiff. Arch Meteorol Geophys Bioklimatol Ser B Klimatol Umweltmeteorol Strahlungsforsch 23(4), p 331-342, 1975.

Descriptors: *Evapotranspiration, *Lysimeter, Methodology, Europe, *Grasses.
Identifiers: West Germany, *Potential evapotranspiration, Thornthwaite method, Haude method.

Results of the computation of the potential evapotranspiration by Thornthwaite and by Haude are discussed and compared with the values of weighable, 1 m² lysimeters with a short grass cover during 4 yr in the Agrometeorological Station of the Meteorological and Climatological Institute in Hannover-Herrenhausen (West Germany).—Copyright 1976, Biological Abstracts, Inc. W77-03118

COMPARATIVE PHOTOSYNTHETIC PRODUCTION OF MOJAVE DESERT SHRUBS. California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
S. A. Bamberg, G. E. Kleinkopf, A. Wallace, and A. Vollmer.
Ecology, Vol. 56, p. 732-736, 1975. 3 fig, 2 tab, 11 ref.

Descriptors: *Transpiration, *Photosynthesis, *Desert plants, *Plant growth, *Moisture content, Water loss, Moisture uptake, Deserts, Arid climates, Water requirements, Radiation, Temperature, Soil moisture, Stress, Moisture stress, Deciduous trees, Adaptation, Energy conversion, Environmental effects, Soil-water-plant relationships, *Shrubs.
Identifiers: Mojave Desert shrubs.

Transpiration and net photosynthetic rates of several species of desert shrubs were measured as a function of season and environmental variables in the northern Mojave Desert. Many desert plants carry out most or all of their photosynthesis and growth during the favorable periods of the year; however, a few species have adapted to desert conditions sufficiently to carry on photosynthesis through the hot, dry summer months. Gas exchange rates were determined for five shrub species under natural field conditions. Water status, temperature, and radiation were recorded simultaneously with net photosynthesis and transpiration. The results are presented. Drought-deciduous species, *Ambrosia dumosa*, *Lycium andersonii*, and *Lycium pallidum*, had higher maximum rates and greater water loss than the evergreen *Larrea tridentata* and summer green *Krameria parvifolia*. Results indicate that plant species in the northern Mojave Desert have a facultative response to moisture and temperature conditions and during favorable periods exhibit renewed photosynthetic activity within a few days, continuing active gas exchange and growth as long as conditions are favorable. The response varies in intensity and length depending on the amount of moisture received and subsequent temperatures. Desert plants, with few exceptions, are extremely labile and exhibit large variability and different adaptive strategies. (Jamail-Arizona) W77-03141

RATES OF PHOTOSYNTHESIS AND TRANSPIRATION AND DIFFUSIVE RESISTANCE OF SIX GRASSES GROWN UNDER CONTROLLED CONDITIONS. Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
A. B. Frank, and R. E. Barker.
Agronomy Journal, Vol. 68, No. 3, p. 487-490, May-June, 1976. 4 fig, 2 tab, 8 ref.

Descriptors: *Photosynthesis, *Transpiration, *Water utilization, *Stomata, *Wheatgrasses, Carbon dioxide, Diffusion, Range grasses, Resistance, Growth stages, Water vapor, Antitranspirants, Moisture stress, Stress, *Grasses, Transpiration control, Plant physiology, Moisture deficit.
Identifiers: *Mesophyll.

Experiments were conducted to determine rates of photosynthesis, transpiration and stomatal diffusion resistance to both water vapor and carbon dioxide in six grass species at three carbon dioxide concentrations and four light intensities. The results are presented. They indicate that the water use efficiency in photosynthesis was greater at heading than at tillering growth stage for all species. From an agronomic standpoint, water use efficiency is based on dry matter production and soil water extraction, and is probably best determined under field conditions. The relationship between water use efficiency calculations utilizing dry matter production as compared with calculations based on transpiration-photosynthesis, transpiration, and stomatal characteristics probably strongly affect the productivity of the forage species being grown. (Jamail-Arizona) W77-03142

CHANGES IN THE TRANSPIRATION RATE AND LEAF WATER CONTENT IN SEVERAL VARIETIES OF CRYPTOMERIA JAPONICA SUBJECTED TO WATER STRESS, (IN JAPANESE). Government Forest Experiment Station, Tokyo (Japan).
J. Kishi.
J Jpn For Soc 57(6); p 197-200, 1975.

Descriptors: *Transpiration, *Leaves, *Moisture content, *Water loss, *Drought resistance, *Drought tolerance, Water requirements, Moisture deficit, Moisture stress.
Identifiers: *Cryptomeria japonica*, Sanbu, Boka.

The resistance to dryness of 'Sanbu' and 'Boka' cultivars of *C. japonica* was studied. One-year old plants were raised in pots with 60-80% water and then the watering was stopped. When the moisture began to decrease, the transpiration rate of 'Sanbu' decreased faster than that of 'Boka'. Accordingly the water contents of the leaves decreased more slowly in 'Sanbu' than in 'Boka'. However, when the moisture was severely decreased, 'Sanbu' showed greater decrease in water contents than 'Boka' did. 'Sanbu' generally grows well in a dry area, although it is susceptible to the dryness of winter. W77-03155

EVAPOTRANSPIRATION REDUCTION BY FIELD GEOMETRY EFFECTS. Oklahoma State Univ., Stillwater. Dept. of Agronomy.
J. F. Stone, G. N. McCauley, E. W. Chin Choy, and H. E. Reeves.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 244. Price codes: A05 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, November 1976. 93 p, 21 fig, 11 tab, 47 ref. Submitted by Oklahoma Agricultural Experiment Station. OWRT B-029-OKLA(1). 14-31-0001-4120.

Descriptors: *Evapotranspiration, *Soil-water-plant relationships, *Transpiration, Water balance, Moisture, Climatology, Air circulation, Advection, Winds, *Peanuts, *Grain sorghum, Cultivation, Energy budget, Moisture availability.
Identifiers: *Row spacing, *Row direction, *Field geometry effects.

The objectives were to identify factors causing peanuts planted in narrow north-south rows to consume less water than in other spacings and orientations and to look for this effect in grain sorghum. Peanuts were studied in 30 and 90 cm rows oriented north-south and east-west. Grain sorghum was studied in 45 and 142 cm north-south rows. Water content of the soil profile was determined by the neutron method and the deep drainage component from the profile was monitored using tensiometers. Micrometeorological conditions were monitored to correlate with

evaporative water loss. Energy balance measurements were obtained and the solar radiation, net radiation, advective energy and latent heat of evaporation by the Bowen Ratio were measured and/or determined. Aerodynamic transport coefficients were measured. Grain sorghum in 45 cm rows and peanuts in 30 cm north-south rows had the lowest evapotranspiration (ET) in 5 of 7 periods of measurement. During periods of moderate to high evaporative demand the ET from the narrow-row treatments was heavily influenced by advective energy and some (apparently physiological) effects which caused a depression in ET during the day. North-south rows during high evaporative demand showed evidence of early stomatal closure. Also north-south rows showed signs of generating greater turbulent transfer of heat. This combination seemed to advect heat away during periods of high stress. During periods of low evaporative demand the ET was nearly equal to net radiation and narrow north-south rows were not necessarily the lowest in ET. W77-03169

THE REGULATION OF TRANSPIRATION EXPENDITURE OF MOISTURE BY PLANTS WITH THE AID OF ANTITRANSPIRANTS, (IN RUSSIAN). Moskovskii Lesotekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 3B. W77-03475

VEGETATIVE WATER USE IN CALIFORNIA, 1974. California State Dept. of Water Resources, Sacramento. Water Use Programs.
For primary bibliographic entry see Field 3F. W77-03554

2E. Streamflow and Runoff

MINIMUM UNIT STREAM POWER AND FLUVIAL HYDRAULICS. Corps of Engineers, Chicago, Ill. North Central Div.
For primary bibliographic entry see Field 8B. W77-03080

FLOW AND BED TOPOGRAPHY IN CURVED OPEN CHANNELS. Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B. W77-03084

EXACT SOLUTION OF GRADUALLY VARIED FLOW. Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B. W77-03085

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 5, HYPOTHETICAL FLOODS. Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B. W77-03104

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 6, WATER SURFACE PROFILES. Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B. W77-03105

STATE AND COUNTY AREA TABULATIONS FOR THE COLORADO RIVER BASIN. Public Health Service, Denver, Colo. Div. of Water Supply and Pollution Control.

Field 2—WATER CYCLE

Group 2E—Streamflow and Runoff

For primary bibliographic entry see Field 7C.
W77-03110

GUIDELINES FOR FLASH FLOOD AND SMALL TRIBUTARY FLOOD PREDICTION.
National Weather Service, Kansas City, Mo. Central Region.
For primary bibliographic entry see Field 4A.
W77-03114

OPTRM - A HYDROLOGIC TRANSPORT MODEL WITH PARAMETER OPTIMIZATION.
Oak Ridge National Lab. Tenn.
For primary bibliographic entry see Field 5B.
W77-03115

THE UNIT HYDROGRAPH: A SATISFACTORY MODEL OF WATERSHED RESPONSE.
Massey Univ., Palmerston North (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 4D.
W77-03126

FLOW DYNAMICS OF THE NEUSE RIVER ESTUARY.
North Carolina State Univ., Raleigh. Dept. of Geosciences.
For primary bibliographic entry see Field 2L.
W77-03300

WET AND DRY PERIODS OF ANNUAL FLOOD SERIES.
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power; and Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering. Z. Sen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY10, Proceedings Paper 12457, p 1503-1514, October 1976. 2 fig, 3 tab, 7 ref, 2 append.

Descriptors: *Droughts, *Floods, *Hydrologic data, Hydrology, Markov processes, Probability, Wet seasons, Statistical methods, Dry seasons, Flow, Correlation analysis.
Identifiers: *Probability theory, *Statistical analysis, Annual flow series, Probabilistic properties, Statistical properties, Correlation coefficient.

A methodology for calculating analytically various probabilities and statistical properties of run lengths of annual hydrological data was developed and applied to the first order Markov processes. In deriving the analytical expressions, the sequential property of the Markovian variables, which reduced the multivariate integral equation into multiplication of various bivariate integrals, was used extensively. Tables were provided for the mean variance coefficient of skewness and coefficient of variation of positive run lengths at various truncation levels and first order serial correlation coefficient. It was observed that run length properties of the Markov processes were the functions of truncation level and first order serial correlation coefficient only. As the serial correlation coefficient increased, the positive run length also increased. (Roberts-ISWS)
W77-03319

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ABOVE SHERWOOD ROAD ON WEST BRANCH DELAWARE RIVER, DELHI, NEW YORK.
Geological Survey, Albany, N. Y. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-03327

DEPTH AND FREQUENCY OF FLOODS IN ILLINOIS.
Geological Survey, Champaign, Ill. Water Resources Div.

B. J. Prugh, Jr.
Illinois Department of Transportation, Springfield, Division of Water Resources report, 1976. 26 p, 6 fig, 5 tab, 11 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Flood recurrence interval, *Regression analysis, *Illinois, Channel morphology, Streamflow, Flow rates, Gaging stations, Flood plain zoning, Flood plain insurance, Rainfall-runoff relationships, Natural flow.
Identifiers: *2-, 5-, 10-, 25-, 50-, 100-year floods.

A method is presented for estimating flood depths of 2-, 5-, 10-, 25-, 50-, and 100-year frequency at ungaged sites in Illinois. Data from 177 U.S. Geological Survey gaging sites in Illinois were analyzed by multiple-regression techniques. Equations to predict depth of water above channel bottom for various frequency floods were developed. The 2-year-flood discharge was used as the descriptive variable. The depth-frequency equations assume normal rainfall-runoff relationships and should be used only for Illinois streams flowing under natural conditions. They do not apply to streams affected by backwater, or significant artificial controls, or in situations where ice or debris jams cause peak stages. (Woodard-USGS)
W77-03346

2F. Groundwater

A THREE-DIMENSIONAL FINITE ELEMENT GROUND WATER MODEL.
California Univ., Davis. Water Science and Engineering Section.
S. K. Gupta, K. K. Tanji, and J. N. Luthin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 925, Price codes: A07 in paper copy, A01 in microfiche. UCAL-WRC-C-152, November 1975. 126 p, 24 fig, 5 tab, 127 ref, append.

Descriptors: *Mathematical models, *Groundwater, *Aquifers, *California, Aquifer systems, Computer programs, Groundwater basins, *Finite element analysis, Equations, Groundwater movement, Aquifer characteristics, Dispersion, Diffusion, Boundaries(Surfaces), Mass transfer.
Identifiers: *Galerkin technique, *Core storage, *Sutter Basin, *Three-dimensional models.

The capability of a three-dimensional model developed in this study was demonstrated by applying it to a real world groundwater system of complex geometry, material characteristics, and initial and boundary conditions. The model used three-dimensional isoparametric elements that can be deformed in x, y, and z directions to handle any type of multi-aquifer geometry in a most economical manner, i.e., higher order elements are required for curved boundaries and lower order for the rest of the region. Other highlights and main features are: (1) core storage requirement is reduced to a minimum by using disk or tape, and also by the use of 'compressed' stiffness matrix; (2) parameters repeatedly required are estimated only once and stored on disk; and (3) different conditions encountered in real world problems and transient cases are handled by executing only the pertinent subprograms. (Visocky-ISWS)
W77-03109

PERMEABILITY AND GROUND WATER CIRCULATION IN THE MADISON AQUIFER ALONG THE EASTERN FLANK OF THE BIGHORN MOUNTAINS OF WYOMING.
Wyoming Univ., Laramie. Dept. of Geology; and Wyoming Univ., Laramie. Water Resources Research Inst.
P. W. Huntton.
In: 28th Annual Field Conference--1976, Wyoming Geological Association Guidebook, p 283-290, 3 fig, 2 tab, 14 ref. OWRT A-019-WYO(3), 14-31-0001-4051,5051,6053.

Descriptors: *Aquifers, *Permeability, *Groundwater recharge, *Wyoming, Groundwater movement.
Identifiers: *Bighorn Mountain range(Wyo), *Madison aquifer(Wyo).

The observed permeability characteristics of the Paleozoic rocks that comprise the Madison aquifer in outcrops along the eastern flank of the Bighorn range are described. The analysis, though qualitative, will help to identify the types of geologic environments in the Powder River Basin where there is potential for ground water production. A second objective is to present in summary fashion the results of quantitative estimates of ground water recharge to the Madison aquifer along the eastern flank of the Bighorn range in Wyoming.
W77-03122

THE OCCURRENCE OF GROUNDWATER IN THE SATPURA REGION OF CENTRAL INDIA.
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W77-03146

HYDROGEOLOGY OF THE MISSOURI RIVER FLOOD PLAIN NEAR GLASGOW, MISSOURI.
Missouri Univ., Columbia. Dept. of Geology.
N. G. Grannemann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 215, Price codes: A06 in paper copy, A01 in microfiche. M. A. Thesis, December 1976. 98 p, 49 fig, 1 tab, 45 ref, 3 append. OWRT A-085-MO(2), 14-34-0001-6026.

Descriptors: *Missouri River, *Flood plains, *Alluvial aquifers, *Mathematical models, Bank storage, *Groundwater, Water levels, Alluvium, Rivers, *Hydrogeology, *Missouri, *Monitoring.

A combination study of field investigation, year-long monitoring of river stage and ground-water conditions, and mathematical modeling provided insights into the unexpected variability of flood-plain hydrogeology. The ground-water system reflects a continuum of change rather than variations from a steady-state condition. Factors controlling ground-water levels are: distance from the river, time since any change in river stage, the geometry of river meanders and valley walls, inhomogeneities in top stratum materials, position of tributary creeks and whether these creeks are influent or effluent, long-term ground-water levels near valley walls, and pumping. It was possible to separate the flood-plain study area into four types of ground-water response: areas of continuing ground-water high, areas of predominantly down valley flow, areas of slow ground-water response, and areas of rapidly fluctuating ground-water levels. River ground-water interactions were found to be predominantly effluent, predominantly influent, or alternating influent-effluent. Examination of field data cast serious doubts on the validity of common bank-storage model assumptions. Major alluvial aquifers are inhomogeneous and may be confined and/or unconfined. Furthermore, the Dupuit-Forchheimer conditions are not valid nor is the assumption of fully penetrating streams. The lower Missouri River Valley alluvium represents a major, but relatively little used aquifer.
W77-03164

NORMAL-MODE ANALYSIS OF THE STRUCTURE OF BASEFLOW RECESSON CURVES.
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown, and R. A. Downing.
Journal of Hydrology, Vol. 30, No. 4, p 327-340, 1976. 6 fig, 1 tab, 8 ref, 1 append.

Descriptors: *Groundwater, *Base flow, *Recession curves, *Flow separation, *Surface-

groundwater relationships, Hydrology, Aquifer characteristics, Subsurface flow, Mathematical models, Subsurface runoff, Equations, Mathematical studies.
Identifiers: *Base flow separation, *Base flow recession, *United Kingdom, Groundwater systems.

In the United Kingdom, semi-logarithmic plots of the baseflow recession for streams which partially penetrate aquifers are frequently not single straight line plots. Modeling studies indicated that this behavior, for typical values of aquifer parameters occurs for even the simplest of groundwater systems. The baseflow component arising from even a simple aquifer should be viewed as a superposition of many, distinct exponential terms. The origin of these terms was shown to arise purely from the dynamics of groundwater flow. A form of the baseflow recession was used to perform empirical fits to observed data. (Terstriep-ISWS)
W77-03313

MEASURED AND SIMULATED GROUND-WATER LEVELS IN THE FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Albany, N. Y. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03326

SUPPLEMENT TO DOCUMENTATION OF FINITE-DIFFERENCE MODEL FOR SIMULATION OF THREE-DIMENSIONAL GROUND-WATER FLOW,
Geological Survey, Reston, Va. Water Resources Div.
P. C. Trescott, and S. P. Larson.
Open-file report 76-591, August 1976. 20 p, 3 fig, 4 ref.

Descriptors: *Computer models, *Groundwater movement, *Saturated flow, *Finite element analysis, Simulation analysis, Equations, Methodology.

User experience has indicated that the documentation of the model of three-dimensional groundwater flow (Trescott and Larson, 1975) should be expanded. This supplement is intended to fulfill that need. The original report emphasized the theory of the strongly implicit procedure, instructions for using the groundwater-flow model, and practical considerations for application. (See also W76-02962 and W76-13085) (Woodard-USGS)
W77-03329

GROUND-WATER LEVELS IN NEW MEXICO, 1975,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03330

HYDRAULIC CHARACTERISTICS OF THE PINEY POINT AQUIFER AND OVERLYING CONFINING BED NEAR DOVER, DELAWARE,
Geological Survey, Parkville, Md. Water Resources Div.
P. P. Leahy.
Delaware Geological Survey, Newark, Report of Investigations No 26, June 1976. 24 p, 6 fig, 6 tab, 14 ref, append.

Descriptors: *Aquifer characteristics, *Hydraulic properties, *Delaware, Data collections, Methodology, Transmissivity, Storage coefficient, Drawdown, Model studies.
Identifiers: *Piney Point aquifer(Del).

The hydraulic properties of the Piney Point (Eocene) aquifer and overlying basal silt of the Chesapeake Group (Miocene) were determined by a 23-day aquifer test conducted at the Danner

Farm Well Field of the City of Dover, Delaware. During the test, head changes were monitored continuously in the Piney Point aquifer, overlying Cheswold (Miocene) aquifer, and the intervening confining bed. Based on an analysis assuming leaky artesian conditions, the transmissivity and storage coefficient of the aquifer are 4,100 sq ft/d and 0.00030, respectively. The confining bed hydraulic properties were determined using a combination of the following methods: (1) analysis of drawdown data in the aquifer by the Hantush leaky artesian type curves, (2) determination of hydraulic diffusivity based on the ratio of head changes in the aquifer to head changes in the confining bed, and (3) analysis of head changes in the confining bed by use of theoretical response curves to determine hydraulic diffusivity. Vertical conductivity cannot be determined directly from any one of these techniques. However, combined use of the methods indicated that the vertical conductivity of the confining bed ranges from 0.000040 to 0.000090. The range of values for specific storage is 0.000030 to 0.000060/ft. These values will be used in a digital model to determine leakage to the Piney Point aquifer in the Dover area. (Woodard-USGS)
W77-03331

BURIED AQUIFERS IN THE BROOTEN-BELGRADE AND LAKE EMILY AREAS, WEST-CENTRAL MINNESOTA--FACTORS RELATED TO DEVELOPING WATER FOR IRRIGATION,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-03335

APPRAISAL OF WATER RESOURCES IN THE HACKENSACK RIVER BASIN, NEW JERSEY,
Geological Survey, Trenton, N. J. Water Resources Div.
L. D. Carswell.
Water-Resources Investigations 76-74, June 1976. 68 p, 18 fig, 1 plate, 2 tab, 38 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Well data, *Water yield, *Water quality, *New Jersey, Hydrogeology, Geologic mapping, Groundwater movement, Saline water intrusion.
Identifiers: *Hackensack River basin(NJ), Brunswick formation.

Bedrock in the Hackensack River basin, New Jersey, the Newark Group of Triassic age, is composed of diabase, sandstone, conglomerate, and shale. The Brunswick Formation is the only important bedrock aquifer in the basin. Water occurs in this aquifer in joints and fractures, generally within 200 feet of land surface in lowland areas and within 500 feet in upland areas. Yields of wells tapping the Brunswick are up to 600 gal/min; the median yield is 100 gal/min. The formation is anisotropic; the greatest permeability is parallel to the strike of bedding. The Newark Group is overlain by unconsolidated deposits of Quaternary age. Sand and gravel aquifers locally yield large quantities of water (greater than 300 gal/min) to wells. Water in the Brunswick Formation is relatively low in dissolved minerals in the upper area of the basin. In the lower area, water in the Brunswick is highly mineralized: specific conductance ranges from 579 to 3,480 micromhos per cubic centimeter; chloride ranges from 19 to 755 mg/liter; and sulfate ranges from 87 to 966 mg/per liter. Chemical quality in the lower area is affected by induced recharge of poor quality surface water. Surface water quality is influenced by tidal flooding and disposal of sewage and industrial wastes. (Woodard-USGS)
W77-03336

CHEMICAL COMPOSITION DATA AND CALCULATED AQUIFER TEMPERATURE FOR

SELECTED WELLS AND SPRINGS OF HONEY LAKE VALLEY, CALIFORNIA.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-03342

HIGH-RESOLUTION SEISMIC REFLECTION PROFILING FOR MAPPING SHALLOW AQUIFERS IN LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-03344

SUMMARY OF GEOLOGY AND GROUND-WATER RESOURCES OF PASSAIC COUNTY, NEW JERSEY,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-03345

GROUND-WATER RESOURCES OF GREELEY AND WICHITA COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans. Water Resources Div.; and Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W77-03347

PROBABLE MAXIMUM FLOOD AT LAKE CHIPPEWA NEAR WINTER, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-03349

2G. Water In Soils

UNDRAINED BEHAVIOR OF EMBANKMENTS ON NEW LISKEARD VARVED CLAY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Constructed Facilities Div.
For primary bibliographic entry see Field 8D.
W77-03108

PIPING IN EARTH DAMS CONSTRUCTED OF DISPERSIVE CLAY: LITERATURE REVIEW AND DESIGN OF LABORATORY TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W77-03112

FACTORS OF SOIL SALINIZATION DURING IRRIGATION IN THE TURAN LOWLAND, (IN RUSSIAN),
V. M. Borovskii.
Izv Akad Nauk Kaz Ssr Ser Biol 13(4), p 1-8, 1975.

Descriptors: *Saline soils, Irrigation, Salts, Soil drainage, Irrigated lands, Drainage systems.
Identifiers: Turan, *USSR.

More than 60% of the irrigated lands of the USSR is located in the Turan lowland, a vast region from the coast of the Caspian Sea to the valley of Ili River on the border of China. The stratum in which water-soluble salts migrate has a thickness up to 100 m. The accumulation of salts in soils, rocks and waters is related with the natural drainage conditions. In regulating the water-salt regime by means of drainage systems and flushings, the salt resources and hydrophysical properties of the entire stratum must be considered.--Copyright 1976, Biological Abstracts, Inc.
W77-03124

Field 2—WATER CYCLE

Group 2G—Water In Soils

THE TRANSPORT OF POLLUTANTS IN GROUND WATER, (IN GERMAN), California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-03131

AFFORESTATION IN LOW RAINFALL AREAS, Department of Forestry, Pretoria (South Africa).
For primary bibliographic entry see Field 4D.
W77-03139

ON THE VALIDITY OF THE THEORY OF FLOW IN SATURATED SWELLING MATERIALS, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles.
Australian Journal of Soil Research, Vol. 14, No. 3, p. 389-395, October 1976. 4 fig, 2 tab, 7 ref.

Descriptors: *Saturated flow, *Soil water movement, *Mathematical studies, *Expansive soils, Hydraulic conductivity, Moisture content, Porous media, Soil physical properties.
Identifiers: Swelling materials.

Recently there has been concern that the reorientation of particles during transient flow of water in a saturated swelling material might result in the hydraulic conductivity and capillary potential not being well-defined functions of the water content. If this were the case, the conventional theory of one-dimensional liquid flow in these materials would be invalid. It is shown that the hydraulic conductivity - water content relationship calculated using physically based approximate theory applied to outflow data obtained from red mud, is single-valued and independent of initial water content. Furthermore, the relationship permits recalculation, using a correct iterative procedure, of the data from which it was derived. It is concluded that the data provide no evidence to reject the theory, and that particle reorientation, if it occurs, is parameterized by the water content. (CSIRO)
W77-03280

INFILTRATION AND WATER MOVEMENT IN AN IN SITU SWELLING SOIL DURING PROLONGED PONDING, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
T. Talsma, and A. van der Leij.
Australian Journal of Soil Research, Vol. 14, No. 3, p. 337-349, October 1976. 8 fig, 2 tab, 18 ref.

Descriptors: *Infiltration, *Soil water movement, *Expansive soils, Soil physical properties, Soil density, Soil moisture, Hydraulic conductivity, Tensiometers.
Identifiers: Swelling soils.

Measurements of infiltration, moisture content, soil water potential, hydraulic conductivity, bulk density, vertical swelling, and the effect of overburden on tensiometer readings, were made over 120 days on a swelling clay soil ponded for rice growing. Infiltration was rapid and water penetrated deeply on the first ponding day. Measured infiltration from 1 to 45 days after ponding corresponded well with theoretical expectations. From 45 to 120 days, the development of a time-variable flow restriction near the soil surface prevented the attainment of a final, steady infiltration rate. During ponding a transient water table developed, moisture profiles were distinctly hydric, and seepage to a deep water table or aquifer was not negligible. Core sample values of hydraulic conductivity agreed with those obtained from mean flux and potential gradients, although conductivity and infiltration rate varied greatly from place to place. Measured swelling agreed favourably with that calculated from bulk density

changes. Indications were obtained that the effect of overburden potential on flow was not large. (CSIRO)
W77-03281

SIMULATION OF FIELD WATER UPTAKE BY PLANTS USING A SOIL WATER DEPENDENT ROOT EXTRACTION FUNCTION, Institute for Land and Water Management Research, Wageningen (Netherlands).
R. A. Feddes, P. Kowalik, K. Kolinska-Malinka, and H. Zaradny.
Journal of Hydrology, Vol. 31, No. 1/2, p. 13-26, September 1976. 10 fig, 1 tab, 16 ref.

Descriptors: *Mathematical models, *Absorption, *Soil-water-plant relationships, *Soil water, *Root systems, Root zone, Pressure head, Hydraulic conductivity, Moisture content, Water balance, On-site data collections, Depth, Equations, Aeration, Soil water movement, Soil gases, Water table, Numerical analysis.
Identifiers: Sink term, Empirical function, Implicit finite-difference model, Oxygen diffusion rate.

Water uptake by roots can be represented by adding a volumetric sink term to the continuity equation for soil water flow. This sink term is often expressed as a product of the difference in pressure head between the soil and the root - soil interface, the hydraulic conductivity of the soil, and some empirical root function. Because of the amount of field work and experimental difficulties involved in determining this root function, an attempt was made to describe the sink term with a simpler expression. In this approach, the sink term was considered to be a function of the soil water content, varying with the latter according to the pressure heads generally known to be critical for water uptake by the roots. An implicit finite-difference model was developed and verified with results obtained experimentally in the field from water balance studies. Although the model does not predict the distribution of soil water content with depth in very accurate detail, the cumulative effect over the entire depth is properly simulated. Comparison of the results of the simpler model with those of the model of Feddes, Bresler, and Neuman, led to the conclusion that both models yield similar results. (Visocky-ISWS)
W77-03315

MEASUREMENT OF NONEXCHANGING PORES DURING MISCIBLE DISPLACEMENT IN SOILS, Massachusetts Agricultural Experiment Station, Amherst.
O. L. Weeks, G. L. Stewart, and M. E. Weeks.
Soil Science, Vol. 122, No. 3, p. 139-144, September 1976. 3 fig, 6 tab, 7 ref.

Descriptors: *Porosity, *Soils, *Analytical techniques, *Instrumentation, Measurement, Soil types, Tritium, Tracers, Diffusion, Pores, Vacuum drying, Distillation.
Identifiers: *Miscible displacement, *Effective porosity, Soil columns.

A simple tritium tracer-vacuum distillation technique was used to determine the percent nonexchanging pores in soils during miscible displacement. Data for soil columns packed with three different soil types were presented and compared with the results of previously reported values. After two pore volumes of displacement, only 1 to 2% of the pore water had not exchanged with the displacing fluid. Previously published work, based upon either mathematical models or experimental data, showed considerably greater values for nonconducting pores in soils. The time required for two pore volumes of displacement in the packed soil columns was sufficient for diffusion of tracer into essentially all of the slowly conducting and nonconducting pores. (Visocky-ISWS)
W77-03320

CALIBRATION OF NEUTRON PROBE IN SOME SELECTED HAWAIIAN SOILS, Hawaiian Sugar Planter Association Experiment Station, Honolulu.
G. A. Shirazi, and M. Isobe.
Soil Science, Vol. 122, No. 3, p. 165-170, September 1976. 3 fig, 2 tab, 15 ref.

Descriptors: *Nuclear meters, *Soils, *Neutron absorption, *Hawaii, Depth, *Calibrations, *Instrumentation, *Measurement, Soil moisture, Laboratory tests.
Identifiers: *Neutron probes.

An investigation was conducted in a laboratory with an N-104A (Troxler) neutron probe to compare the calibration curves of different soil materials, to determine the depth of maximum resolution, and to define the sphere of importance. Statistical tests of regression lines, relating relative counts to volumetric moisture content, indicated that the calibrations for the three materials (silty clay soil, Catano sand, and silica sand) differed from one another. Based on the findings with silica and Catano sand, it was concluded that the sphere of importance is within a radius of only 15 to 18 cm, and the depth of maximum resolution is 15 cm when measured from the end of the probe. (Visocky-ISWS)
W77-03321

REACTIONS OF HEAVY METALS WITH SOILS WITH SPECIAL REGARD TO THEIR APPLICATION IN SEWAGE WASTES, Melbourne Univ., Parkville (Australia). Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 5B.
W77-03359

SOIL POTASSIUM RELATIONSHIPS AS INDICATED BY SOLUTION EQUILIBRATIONS AND PLANT UPTAKE, Ohio State Univ., Columbus. Dept. of Agronomy.
D. A. Munn, and E. O. McLean.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p. 1072-1076, November-December 1975. 2 fig, 7 tab, 17 ref.

Descriptors: *Potassium, *Corn(Field), *Ohio, Soils, Soil investigations, Soil chemistry, Nutrients, Fertilizer, Fertilization.

Four Ohio soils of wide range in K release capability were initially K-treated and successively cropped three times with corn in a growth chamber. Aliquots of the soils with and without K added and before and after cropping were assayed by extraction, equilibration, and plant uptake techniques for the effects of cropping and K-treatment. Uptake of K by the corn was closely related to the K release capabilities of the soils. Exchangeable K increased as rate of K increased. Initial cropping decreased the exchangeable K in all soils eliminating the effect of K treatments on exchangeable K. However, after initial cropping where no K was added, exchangeable K varied sixfold from the lowest to the highest. (Skogerboe-Colo St)
W77-03395

EFFECT OF ADDED SALTS ON NITROGEN RELEASED AND NITRATE LEVELS IN FOREST SOILS OF THE WASHINGTON COASTAL AREA, Western Washington Research and Extension Center, Puyallup.
P. Heilman.
Soil Science Society of America Proceedings, Vol. 39, No. 4, p. 778-782, July-August 1975. 2 fig, 4 tab, 20 ref.

Descriptors: *Nitrogen, *Nutrients, Salts, Salinity, *Nitrates, Nitrification, *Washington, Coasts.
Identifiers: *Mineralization, *Forest soils.

The release and mineralization of N was studied in incubated samples of 10 forested soils from the Washington Coast which had been treated with a variety of salts. Salts were added in solution at 0.005, 0.05, and 0.2M concentrations and the samples were incubated at 27°C for 7, 14, and 21 days. Release of $\text{NH}_4\text{-N}$ plus $\text{NO}_3\text{-N}$ increased with increase in the duration of incubation and concentration. The lowest concentration of salt increased N release over that from distilled water. (Skogerboe-Colo St) W77-03396

PREDICTION OF WATER TRANSMISSION IN CONDITIONED SOILS,
Wisconsin Univ., Madison.
W. R. Gardner, and M. F. De Boodt.
Meded Fac Landbouwwet Rijksuniv Gent., Vol 37, No. 3, p 1150-1159, 1972.

Descriptors: *Forecasting, *Soils, *Soil water movement, On-site Investigations, Methodology.

If some system for screening possible soils to be treated or to be tested is not devised, it seems unlikely that those situations where soil conditioning is most desirable will be found by trial and error. The expense of such field trials is simply too great to ensure that the right combination of circumstances will be found. How best to measure the scale factor and the parameter n is not discussed here. It is hoped that at the conclusion of ongoing laboratory studies it will be possible to make specific recommendations as to suitable procedures.—Copyright 1974, Biological Abstracts, Inc. W77-03451

2H. Lakes

DISTRIBUTION OF PELAGIC ZOOPLANKTON WITHIN A THERMAL GRADIENT IN LAKE COLUMBIA, A COOLING LAKE NEAR PORTAGE, WISCONSIN,
Wisconsin Univ., Madison. Lab., of Limnology.
For primary bibliographic entry see Field 5C. W77-03077

DISTRIBUTION AND FEEDING OF PUMPKINSEED (LEPOMIS GIBBOSUS) AND BLACK CRAPPIE (POMOXIS NIGROMACULATUS) IN A POWER PLANT COOLING LAKE,
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 5C. W77-03078

COASTAL REGION RESIDENCE TIME ESTIMATES FROM CONCENTRATION GRADIENTS,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5C. W77-03093

IMPACTS OF THE DEPOSITION OF DREDGED SPOILS ON LAKE ERIE SEDIMENT QUALITY AND ASSOCIATED BIOTA,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
For primary bibliographic entry see Field 5C. W77-03094

BEACH PROCESSES, PERRIEN COUNTY, MICHIGAN,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 2J. W77-03095

PRECIPITATION CHEMISTRY STUDIES AT LAKE GEORGE: ACID RAINS,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5A. W77-03098

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM: FIRST YEAR WORK PRODUCT. VOLUME II. COASTAL GEOLOGICAL STUDIES.
Illinois State Geological Survey, Urbana.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 136. Price codes: A13 in paper copy, A01 in microfiche. FY1975 Report, October 1975. 285 p.

Descriptors: *Geology, *Erosion, *Geological surveys, *Lake Michigan, *Illinois, Surveys, Coasts, Shores, Lakes, Beaches, Beach erosion, Geologic investigations, Water levels, Storms, Waves(Water), Remote sensing, Satellites(Artificial).
Identifiers: *Bluffs, *Bluff erosion.

This report is the second volume of four dealing with the Illinois Coastal Zone Management Program. Included in this particular report are physical data prepared by the Illinois State Geological Survey for the time period FY1975. Included in the report are seven studies on different aspects of the Lake Michigan-Illinois shoreline. The studies offered data on the following: beach distribution and condition, distribution and levels of erosion, conditions of shore stability, distribution and kinds of shore protection, and areas and conditions of hazard. These categories were subdivided and grouped by political units, thereby providing a summary of shore conditions and problems for each community. All of the studies reported here continue along with the new projects begun in FY1976. (See also W76-12686) (Sims-ISWS) W77-03103

BIOGEOCHEMICAL DEVELOPMENT OF THE LAKE OF GENEVA (SWITZERLAND) FROM 1957 TO 1973: PART III, (IN FRENCH),
Paris Univ., Thonon-les-Bains (France). Center for Geodynamic Research.
For primary bibliographic entry see Field 5C. W77-03144

THE RELATIONSHIP OF BOTTOM SEDIMENTS TO BACTERIAL WATER QUALITY IN A RECREATIONAL SWIMMING AREA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5B. W77-03167

HEAVY METALS IN LAKES OF THE COEUR D'ALENE RIVER VALLEY, IDAHO,
Idaho Univ., Moscow. Dept. of Zoology.
For primary bibliographic entry see Field 5B. W77-03207

PHYSIOCHEMICAL AND BIOLOGICAL CONDITIONS IN TWO OKLAHOMA RESERVOIRS UNDERGOING ARTIFICIAL DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agriculture Engineering.
J. E. Garton, R. C. Summerfelt, D. W. Toetz, J. L. Wilhm, and H. R. Jarrell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-262 365. Price codes: A07 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, July 1976. 138 p, 33 fig, 35 tab, 103 ref. OWRT C-5228 (No. 4215)(3) and A-028-OKLA(2), A-044-OKLA(3), A-048-OKLA(2), A-050-OKLA(4), A-052-OKLA(1), A-059-OKLA(3).

Descriptors: Stratification, *Physicochemical properties, Algae, Zooplankton, Invertebrates, Benthos, Lakes, *Oklahoma, Reservoirs, *Destratification, *Biological properties, *Pumps, *Pumping, Aeration, Fish, Growth rates, Distribution.
Identifiers: Lake of the Arbuckles(Okla), Ham's Lake(Okla).

A 1.83 m pump was used to destratify a 40 ha lake (Ham's Lake, Oklahoma) which was 9.5 m deep. This 1 hp device was able to destratify the lake in about one week. The effects of the pump operation on physicochemical variables were determined. Algae species composition and density, zooplankton species composition and diversity, benthic macroinvertebrates species composition, diversity and density, and the distribution and growth of fish were measured. A 5 m pump was used on a lake (Lake of the Arbuckles, Oklahoma) with 23 times the area and 3 times the depth of Ham's Lake. The same parameters were measured. The device caused the lake to turnover 1 month earlier and more completely than in previous years. This pump has the capability of increasing the oxygen content of waters being released without destratifying a lake. W77-03208

BIOLOGICAL AND CHEMICAL EVALUATION OF THE AQUATIC ENVIRONMENT OF SELECTED UNDEVELOPED KENTUCKY LAKE EMBAYMENTS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5C. W77-03209

ORGANIC PHOSPHORUS IN LAKES,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C. W77-03210

ASPECTS OF THE CHEMICAL VARIABILITY OF SOME TASMANIAN INLAND WATERS (AUSTRALIA),
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2K. W77-03283

CHEMISTRY OF SALT LAKES AND OTHER WATERS IN THE SUB-HUMID REGIONS OF TASMANIA (AUSTRALIA),
Tasmania Univ., Hobart (Australia). Dept. of Botany.
R. T. Buckney, and P. A. Tyler.
Australian Journal of Marine and Freshwater Research, Vol. 27, No. 3, p. 359-366, September 1976. 3 fig, 4 tab, 32 ref.

Descriptors: *Saline lakes, *Water chemistry, *Australia, Surface waters, Ions, Surveys, Lagoons, Salinity, Climates.
Identifiers: *Tasmania.

Within a large area of Tasmania, described as the sub-humid province, annual evaporation exceeds precipitation, so that closed saline lakes may occur. Analyses are presented of the major chemical features of pans and lagoons within this region. The waters sampled are classed as fresh or saline, using a criterion which is a function of relative ionic composition. Saline waters are regarded as having ionic composition limited by the solubility of alkaline earth carbohydrates, and they have a composition akin to that of sea water. The fauna of salt pans is briefly mentioned, and some relationships between ionic concentrations and other chemical parameters are reassessed for the entire salinity range of Tasmanian inland waters. (CSIRO) W77-03284

Field 2—WATER CYCLE

Group 2H—Lakes

STABILITY OF IONIC PROPORTIONS IN FIVE SALT LAKES IN VICTORIA, AUSTRALIA, Adelaide Univ. (Australia). Dept. of Zoology. W. D. Williams, and R. T. Buckney. Australian Journal of Marine and Freshwater Research, Vol. 27, No. 3, p. 367-377, September 1976. 6 fig, 3 tab, 28 ref.

Descriptors: *Saline lakes, *Australia, *Ions, Salinity, Water chemistry, Seasonal, Variability, Ecology, Physicochemical properties. Identifiers: *Victoria.

Variability is the most salient feature of the physicochemistry of inland salt lakes, and is of fundamental ecological importance. As differences in ionic proportions have an influence on some components of the faunas of salt lakes, an investigation was undertaken to assess seasonal variation in some saline Victorian lakes whose ecology is also under study. Samples taken approximately monthly over a four-year period show that although total salt concentration varied widely in all lakes the ionic proportions of major cations and anions were remarkably constant. (CSIRO) W77-03285

CHEMICAL COMPOSITION OF SOME INLAND SURFACE WATERS IN SOUTH, WESTERN, AND NORTHERN AUSTRALIA, Adelaide Univ. (Australia). Dept. of Zoology. For primary bibliographic entry see Field 2K. W77-03286

WIND-INDUCED WATER LEVEL OSCILLATIONS IN SHALLOW LAGOONS, Adelaide Univ., (Australia). Dept. of Applied Mathematics. B. J. Noye, and P. J. Walsh. Australian Journal of Marine and Freshwater Research, Vol. 27, No. 3, p. 417-430, September 1976. 9 fig, 16 ref.

Descriptors: *Water level fluctuations, *Lakes, *Winds, Waves(Water), Lagoons, *Australia, Mathematical studies. Identifiers: Shallow lagoons.

Use is made of the concept of the frequency response function to analyse long-wave oscillations of the surface of a closed lake which is subject to forcing by tangential wind stresses. By comparison of a response function calculated from data taken from the North Coorong - an almost land-locked lagoon south of Adelaide, South Australia - with the theoretical, one-dimensional response calculated for a rectangular, constant-depth lake with dimensions equivalent to the average dimensions of this body of water, an estimate is made of the damping parameter for the lagoon. Predictions of wind-induced water level changes using the response function method agree well with recorded values. (CSIRO) W77-03287

THE CLASSIFICATION AND GEOMORPHIC IMPLICATIONS OF THAW LAKES ON THE ARCTIC COASTAL PLAIN, ALASKA, Cold Regions Research and Engineering Lab., Hanover, N.H. Northern Engineering Research Branch. For primary bibliographic entry see Field 2C. W77-03296

LANDSLIDE GENERATED WATER WAVE MODEL, Alabama Univ., University. Dept. of Engineering Mechanics. For primary bibliographic entry see Field 8B. W77-03318

PROBABLE MAXIMUM FLOOD AT LAKE CHIPPEWA NEAR WINTER, WISCONSIN, Geological Survey, Madison, Wis. Water Resources Div. For primary bibliographic entry see Field 4A. W77-03349

DATA ON SELECTED LAKES IN WASHINGTON, PART 5, Geological Survey, Tacoma, Wash. Water Resources Div. For primary bibliographic entry see Field 7C. W77-03350

THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS, Michigan Univ., Ann Arbor. For primary bibliographic entry see Field 5C. W77-03354

EXPERIMENTAL STUDIES ON MATERIAL TRANSACTIONS BETWEEN MUD AND WATER OF THE GNADENSEE, For primary bibliographic entry see Field 5C. W77-03370

REPORT ON POLLUTION IN LAS VEGAS WASH AND LAS VEGAS BAY, Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Technical Services. For primary bibliographic entry see Field 5C. W77-03371

EVALUATION OF LAKE MILNER WATER QUALITY MODEL, Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 5B. W77-03373

THE PRIMARY PRODUCTION OF THE PERIPHYTON ASSOCIATION OEDOGONIO-EPITHEMIETUM LITORALAE, For primary bibliographic entry see Field 5C. W77-03374

THE IMPACT OF A FOREST FIRE ON A WILDERNESS LAKE IN NORTHEASTERN MINNESOTA, Minnesota Univ., Minneapolis. Limnological Research Center. For primary bibliographic entry see Field 5B. W77-03375

THE PRIMARY PRODUCTION OF LAKE SIBAYA, KWAZULU, SOUTH AFRICA, For primary bibliographic entry see Field 5C. W77-03376

LAKE PHOSPHORUS LOADING GRAPHS: AN ALTERNATIVE, Environmental Protection Agency, Corvallis, Oreg. Eutrophication and Lake Restoration Branch. For primary bibliographic entry see Field 5C. W77-03377

WATER QUALITY IN THE CALUMET AREA. CONFERENCE ON POLLUTION OF LOWER LAKE MICHIGAN, CALUMET RIVER, GRAND CALUMET RIVER, LITTLE CALUMET RIVER, AND WOLF LAKE, ILLINOIS AND INDIANA, Department of Health, Education, and Welfare, Washington, D.C. Technical Committee on Water Quality. For primary bibliographic entry see Field 5B. W77-03382

GREAT LAKES WATER QUALITY; FOURTH ANNUAL REPORT TO THE INTERNATIONAL JOINT COMMISSION, International Joint Commission-United States and Canada. Great Lakes Water Quality Board. For primary bibliographic entry see Field 5G. W77-03383

A PRELIMINARY STUDY OF THE TASTE AND ODOR PROBLEMS IN GRAND LAKE, OHIO AND THE WABASH RIVERS, INDIANA, Federal Water Pollution Control Administration, Evansville, Ind. Ohio River Basin Project. For primary bibliographic entry see Field 5C. W77-03384

INVESTIGATIONS ON THE ROLE OF DISSOLVED ORGANIC MATTER IN DETERMINING ECOSYSTEM STRUCTURE AND FUNCTION: THE PLANKTON AND PHOTOHETEROTROPHY, Michigan State Univ., East Lansing. Dept. of Botany. For primary bibliographic entry see Field 5C. W77-03389

RESPONSE OF DAPHNIA POPULATION SIZE AND AGE STRUCTURE TO PREDATION, Washington Univ., Seattle. Dept. of Zoology. H. G. Hairston, Jr., and R. A. Pastorok. Available from the National Technical Information Service, Springfield, VA 22161 as RLO 2225 T234, Price codes: A02 in paper copy, A01 in microfiche. 1975. 17 p, 4 fig, 2 tab, 11 ref. AT(45-1)-2225 TA 23.

Descriptors: *Predation, *Rainbow trout, *Model studies, *Daphnia, Diptera, Prey fish, Competition, Secondary productivity, Ecology, Invertebrates, Lakes, Simulation, Mathematical models, Zooplankton, *Michigan. Identifiers: *Sporley Lake(Mich), Cascading models.

Simulated application of a mathematical cascade model of size-selective predation shows that the introduction of rainbow trout into Sporley Lake, Michigan cannot be blamed for an observed demise of the lake's Daphnia population. The finding supports earlier research suggesting that other fish entering the lake at the same time as the trout must have played an important role in the dynamics of the Daphnia. The mathematical cascade model is a population projection matrix in which future population sizes and age structures can be projected - given the size, fecundity and survivorship of each age class of a starting population. The model attempts to show how the preference of predatory fish to feed on larger and older egg-bearing species, compared with the preference of invertebrate predators such as Chaoborus for smaller and younger zooplankton, affects age structure and numbers of a single species of prey population. A predation cascade is described, including fish feeding preferences, changes in predation as related to decreasing numbers of available prey, secondary and lesser instar preferences of predators and parameter values. Application of the model shows there are age distributions characteristic of constant growth rate and there are other distinct age distributions characteristic of crashing populations or of particular portions of oscillating populations. (Harris-Wisconsin) W77-03390

SILT REMOVAL FROM A LAKE BOTTOM, Lake Herman Development Association, Inc., Madison, S. Dak. For primary bibliographic entry see Field 5C. W77-03392

EUTROPHICATION AND RESTORATION OF LAKES RECEIVING NUTRIENTS FROM DIFFUSE SOURCES ONLY.
For primary bibliographic entry see Field 5C.
W77-03536

PHYTOPLANKTON RESPONSE TO PHOSPHORUS AND SILICA ENRICHMENTS IN LAKE MICHIGAN.
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W77-03537

LIMNOLOGICAL CHARACTERISTICS OF STRIP MINE PONDS IN NORTHWESTERN COLORADO, U.S.A.
For primary bibliographic entry see Field 5C.
W77-03538

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION. VOL. 17. INLAND FISHES OF THE LAKE MICHIGAN DRAINAGE BASIN.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 6G.
W77-03566

PRECIPITATION ON THE ARAL SEA SURFACE, (IN RUSSIAN).
For primary bibliographic entry see Field 2B.
W77-03592

THE PEOPLE'S LAKE,
Save Lake Superior Association, Duluth, Minn.
For primary bibliographic entry see Field 5G.
W77-03594

WATER QUALITY, PLANKTON AND EUTROPHICATION OF BERGSVATNET, EIKEREN AND FISKUMVATNET, S. NORWAY, (IN NORWEGIAN).
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5C.
W77-03595

GROWTH, MORTALITY AND PRODUCTION OF BRACHYSYNODONTIS BATENSODA (PISCES, MOCHOCIDAE) IN THE SOUTHEASTERN ARCHIPELAGO OF LAKE TCHAD, (IN FRENCH).
V. Benech.
Cahorsom Ser Hydrobiol 9(2), p 91-103, 1975.

Descriptors: Biomass, *Productivity, Lakes, *Growth rates, *Mortality, Droughts, Fish, Fish food organisms, Zooplankton.
Identifiers: *Brachysynodontis-Batensoda, *Mochocidae, *Lake Chad, Pelagic fish.

In the SE archipelago of Lake Chad, monthly fishing with gill nets and seines were used to study the growth, mortality and production of *B. batensoda* from April 1971-March 1974. Owing to the drought in 1972 and 1973, the water level lowered 2.70 m; the 1st semester 1973, the archipelago was cut off from the lake and 90% of its water surface dried. Before the drought the abundance of age class 70 (cohort b) probably inhibited the growth of the other age classes. The decrease in the catch per unit effort gives a mortality estimate of cohort b and, according to Allen's method, its net production is 38 kg/ha per yr. The production/mean biomass ratio is 0.968. From the 2nd semester 1972 onwards, the reduction of living space of this zooplankton feeding pelagic fish led to persistent growth inhibition. A condition factor study indicates a slight weight increase since the flood (October 1973).—Copyright 1976, Biological Abstracts, Inc.
W77-03597

21. Water In Plants

EFFECT OF WATER STRESS ON THE PHASIC DEVELOPMENT OF ANNUAL MEDICAGO SPECIES.
Queensland Dept. of Primary Industries, Warwick (Australia).
N. M. Clarkson, and J. S. Russell.
Australian Journal of Agricultural Research, Vol. 27, p 227-234, 1976. 2 fig, 2 tab, 16 ref.

Descriptors: *Moisture stress, *Soil water, *Soil-water-plant relationships, *Crop response, Moisture content, *Alfalfa, Stress, Moisture, Soil types, Clays, Soil chemistry, Chemical properties, Wilting, Growth stages, Field capacity, Crops.
Identifiers: *Phasic development(Alfalfa).

The extent to which water stress affects the phasic development and growth of annual medics is of considerable importance in assessing the yield and survival potential of cultivars in subtropical eastern Australia. The effects of water stress on the phasic development of six annual Medicago species were examined in a laboratory experiment where plants were grown from seed to maturity under four different watering regimes. The phasic development of the plants was examined at 2-day intervals. Stress was varied by allowing the soil to dehydrate to different degrees before rewetting, the cycles being repeated continuously. The results presented suggest that annual medics have no mechanisms for evading dry seasonal conditions by earlier flowering, but once flowering has begun phasic development is accelerated in some species by water stress. The implications of this research for the interpretation and prediction of field behavior of annual medics are that water stress can affect phasic development mainly through a delay in flowering. However, those effects appear to be small compared with those due to vernalization, photoperiod and temperature. (Jamaal-Arizona)
W77-03136

A COMPARISON OF SEASONAL PRIMARY PRODUCTION OF MOJAVE DESERT SHRUBS DURING WET AND DRY YEARS.
EG and G Environmental Consultants, Denver, Colo.
S. A. Bamberg, A. T. Vollmer, G. E. Kleinkopf, and T. L. Ackerman.
The American Midland Naturalist, Vol. 95, No. 2, p 398-405, April, 1976. 2 fig, 2 tab, 18 ref.

Descriptors: *Photosynthesis, *Desert plants, *Primary productivity, *Plant growth, Carbon dioxide, Moisture stress, Moisture content, Water requirements, Energy conversion, Stress, Transpiration, Terrestrial habitats, Rainfall, Precipitation(Atmospheric), Arid climates, Ecosystems, *Shrubs.
Identifiers: *Mojave Desert shrubs.

The net primary production of Mojave Desert shrubs during two seasons is compared with contrasting moisture conditions using both a destructive harvest technique and gas exchange measurements throughout the growing season. Net primary production estimates of desert shrubs were determined by carbon dioxide exchange and harvest methods at the Nevada site. Gas exchange rates were measured on shrubs under natural field conditions using a modified Siemens null-point chamber. Production gains varied among species depending on whether the species was favored by the cool, moist spring of 1973. *Lycium andersonii* and *Lycium pallidum*, which have high photosynthetic rates and start growth in the early spring, showed the greatest increases. *Larrea tridentata* and *Krameria parvifolia*, species adapted to growing under warmer, drier conditions, exhibited the smallest changes in production. *Ambrosia dumosa*, which has high photosynthetic rates but responds more favorably to warmer spring temperatures than the *Lycium*

species, had moderate production gains. Reasons for the different estimates obtained by the two methods are discussed and evaluated. (Jamaal-Arizona)
W77-03138

WATER STRESS INDUCED ALTERATIONS OF THE STOMATAL RESPONSE TO DECREASES IN LEAF WATER POTENTIAL.
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
K. W. Brown, W. R. Jordan, and J. C. Thomas.
Physiologia Plantarum, Vol. 37, No. 1, p 1-5, 1976. 4 fig, 27 ref.

Descriptors: *Stomata, *Moisture stress, Osmotic pressure, *Moisture deficit, *Moisture tension, Leaves, Stress, Moisture, Growth chambers, Cotton, Soil water, Moisture content, Plant growth, Plant physiology, Photosynthesis.
Identifiers: *Leaf water potential, Stomatal response.

An experiment was conducted to document adjustments in stomatal response to leaf water potential of cotton resulting from preconditioning water stress and to investigate the mechanism responsible for any adjustment found. Young growth-chamber cotton plants were subjected to a series of eight periods of soil water stress, which served as a preconditioning treatment. After preconditioning, water was withheld and changes in the stomatal resistance and leaf water potential were determined and compared with similar well watered control plants. Results indicate that the stomatal response of stress-preconditioned plants adjusted significantly. The resistance - leaf water potential relation for the adaxial surface, was unaltered by the preconditioning treatment. Adjustment of the osmotic potential of guard cells on the abaxial surface provides at least a partial explanation of this change in response. The lack of adjustment of stomatal response on the adaxial surface of the leaves was correlated with a lack of adjustment in osmotic potential of guard cells on that surface. (Jamaal-Arizona)
W77-03140

CULTIVATION AND BREEDING OF OENOTHERA-PLANT: IV. EFFECT OF SOIL MOISTURE ON GROWTH AND COMPONENTS IN SEED OF O. BIENNIS, (IN JAPANESE).
Nagasaki Univ. (Japan). Faculty of Pharmaceutical Science.
N. Skokuy, I. Watanabe, J. Fujimoto, and H. Ohashi.
Soyakugaku Zasshi 28(2), p 134-138, 1974.

Descriptors: *Soil moisture, *Plant growth, Plant physiology, Plant growth regulators, Methodology, Resistivity.
Identifiers: Breeding, Linolenic-acid, Oenothera, *Oenothera-biennis, Seed oil.

The weight method and the electric resistance method (using the watering controller) were used. Soil moisture is expressed as percentages of water capacity. Soil moisture was better controlled by the watering controller than by the weight method. Most suitable for plant growth and greatest seed yield was 60-40% soil moisture. Content and quality of seed oil were influenced little by soil moisture. When soil moisture. When soil moisture was extremely reduced the value diminished. Soil moisture of 60-40% increased oil yield and gamma-linolenic acid.—Copyright 1976, Biological Abstracts, Inc.
W77-03148

CHANGES IN THE TRANSPIRATION RATE AND LEAF WATER CONTENT IN SEVERAL VARIETIES OF CRYPTOMERIA JAPONICA SUBJECTED TO WATER STRESS, (IN JAPANESE).
Government Forest Experiment Station, Tokyo (Japan).

Field 2—WATER CYCLE

Group 21—Water In Plants

For primary bibliographic entry see Field 2D.
W77-03155

REPRODUCTION BY AFLUVIAL SALMONIDS IN SPAWN CREEK, CACHE COUNTY, UTAH.
Utah State Univ., Logan. Coll. of Engineering.
D. R. Bernard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 222.
Price codes: A06 in paper copy, A01 in microfiche.
Masters Thesis in Wildlife Science, 1976. 89 p, 28 tab, 9 fig, 56 ref. OWRB B-105-UTAH(2). 14-31-0001-4135.

Descriptors: *Fish reproduction, Aquatic habitats, Water temperature, *Salmonids, *Utah, *Fish migration, *Trout, Brook trout, Brown trout, Cutthroat trout, Watershed management, Growth rates, Streams.
Identifiers: *Afluvial salmonids, *Spawn Creek (Utah), Cache County (Utah).

This study concerned the migration and production of indigenous populations of brown, brook, and cutthroat trout in Spawn Creek, Cache County, Utah for the years 1973 and 1974. Important characteristics of Spawn Creek and its watershed were described, including the prevalent, aquatic taxa of fauna and flora. A two-way fish trap and electro-fishing gear, were used to collect data for periodic estimates of mean weight and density stratified by year classes. The estimates of density were obtained through a modified form of the two-catch removal estimator. Mathematical models to describe the time-dependent growth and density were constructed from the von Bertalanffy equation and the equation of compensatory mortality by adding trigonometric components to each. The periodic estimates from the data showed that several year classes such as the 1971 year class of cutthroat trout and the 1970 and 1971 year classes of brook trout, were numerically dominant in 1973 but not in 1974. Immigration occurred seasonally with the adult cutthroat trout migrating in the spring, and the juvenile cutthroat and brown trout moving in the fall. Migration of brook trout was not significant. Production was greater in the growing season of 1973 than in 1974 for all species. The failure of the brook trout to produce new dominant year classes was attributed to the evacuation of beaver and the subsequent dilapidation of their ponds.
W77-03160

EVAPOTRANSPIRATION REDUCTION BY FIELD GEOMETRY EFFECTS.
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W77-03169

SIMULATION OF FIELD WATER UPTAKE BY PLANTS USING A SOIL WATER DEPENDENT ROOT EXTRACTION FUNCTION.
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 2G.
W77-03315

A REVIEW OF CLUSTERING TECHNIQUES WITH EMPHASIS ON BENTHIC ECOLOGY.
Portland State Univ., Oreg. Urban Studies Center.
For primary bibliographic entry see Field 5A.
W77-03372

DIURNAL FLUCTUATION OF LEAF-WATER POTENTIAL OF CORN AS INFLUENCED BY SOIL MATRIC POTENTIAL AND MICROCLIMATE.
Agricultural Research Service, Florence, S. C. Coastal Plains Soil and Water Conservation Research Center.
For primary bibliographic entry see Field 3F.

W77-03394

SOIL POTASSIUM RELATIONSHIPS AS INDICATED BY SOLUTION EQUILIBRATIONS AND PLANT UPTAKE.
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-03395

THE REGULATION OF TRANSPIRATION EXPENDITURE OF MOISTURE BY PLANTS WITH THE AID OF ANTITRANSPIRANTS, (IN RUSSIAN).
Moskovskii Lesotekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 3B.
W77-03475

EXPERIMENTAL ECOLOGY OF SELECTED VERTEBRATE SPECIES.
Pittsburgh Univ., Pa.
For primary bibliographic entry see Field 6G.
W77-03564

2J. Erosion and Sedimentation

MINIMUM UNIT STREAM POWER AND FLUVIAL HYDRAULICS.
Corps of Engineers, Chicago, Ill. North Central Div.
For primary bibliographic entry see Field 8B.
W77-03080

IMPACTS OF THE DEPOSITION OF DREDGED SPOILS ON LAKE ERIE SEDIMENT QUALITY AND ASSOCIATED BIOTA.
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
For primary bibliographic entry see Field 5C.
W77-03094

BEACH PROCESSES, PERRIEN COUNTY, MICHIGAN.
Florida State Univ., Tallahassee. Dept. of Geology.
W. F. Tanner.
Journal of Great Lakes Research, Vol. 1, No. 1, p 171-178, October 1975. 3 fig, 8 ref.

Descriptors: *Lake Michigan, *Beach erosion, *Model studies, *Michigan, Lakes, Shore protection, Littoral drift, Waves (Water), Water levels, Erosion, Coasts, Model studies, Sediment transport, Lake shores.
Identifiers: Beach pads.

The level of Lake Michigan rose markedly and rapidly in the decade 1964-1974. Theoretically, a significant rise in lake level is accompanied and followed by an important increase in beach erosion; much or most of the sand eroded should be carried offshore, rather than in the littoral drift system. Computer simulation, measures of erosion rates on air photos, depletion of an artificial sand stockpile, beach pad histories, and other studies indicated that the theoretical effects have also been the actual results. The theoretical projection was confirmed. The importance of transverse transport (more or less at right angles to littoral transport) in the study area points up the fact that presently known types of coastal defense works, largely designed with littoral drift in mind, may not be effective on segments of coast where water levels are rising or have recently risen significantly. Although littoral drift in the study area has been limited, it has operated clearly in the form of "beach pads", discrete masses of sand which move at measurable rates. Beach pads were derived from an artificial stockpile of sand, but, in this case, not from erosion of the natural dunes. Each beach pad, with its associated bar, furnishes a diagonal path along which sand is transported

from the beach into deeper water under oblique wave attack. The amount of sand moved offshore in this way is not measured by considering the migration rate of the pads. (Humphreys-ISWS)
W77-03095

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM: FIRST YEAR WORK PRODUCT. VOLUME II. COASTAL GEOLOGICAL STUDIES.
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 2H.
W77-03103

PIPING IN EARTH DAMS CONSTRUCTED OF DISPERSIVE CLAY; LITERATURE REVIEW AND DESIGN OF LABORATORY TESTS.
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W77-03112

DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE GULF OF ALASKA AND SOUTHEASTERN BERING SHELF.
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W77-03248

NATURE AND GENESIS OF SOME STORM WASHOVER DEPOSITS.
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W77-03293

SCOUR AROUND BRIDGE PIERS.
West Virginia Univ., Morgantown. Engineering Experiment Station.
For primary bibliographic entry see Field 8B.
W77-03294

COMPUTER PROGRAMS FOR SEDIMENT TRANSPORT, DOCUMENTATION AND LISTING.
Colorado State Univ., Fort Collins. Engineering Research Center.
K. Mahmood, and V. M. Ponce.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 838.
Price codes: A06 in paper copy, A01 in microfiche.
Report CER75-76 KM-VMP 2, August 1975. 96 p, 8 ref, append. NSF ENG72-00274-A01, OIP75-15976.

Descriptors: *Computer programs, *Sediment transport, *Sedimentation, Suspended solids, Bed load, Beds, River beds, Erosion, Publications, Sediments, Data processing, Computer models, Digital computers, Documentation.

Five FORTRAN programs for the computation of sediment transport were presented in the form of a reference manual with documentation and listing included. The programs deal with the following methods: (1) Einstein Bed-Load Function, (2) Mahmood's Bed Material Transport Function, (3) Colby's Bed Material Load Method, (4) Meyer-Peter and Muller Bed-Load Equation, and (5) Modified Einstein Procedure. The programs are written in FORTRAN IV language and have been extensively tested on the CDC 6400 Computer at the Colorado State University using Scope 3.3. (Sims-ISWS)
W77-03298

SEDIMENT MASS BALANCE OF A LARGE ESTUARY, LONG ISLAND SOUND,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W77-03323

RELATIONSHIPS BETWEEN SAND INPUT FROM RIVERS AND THE COMPOSITION OF SANDS FROM THE BEACHES OF SOUTHERN CALIFORNIA,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2L.
W77-03324

A CINE-CAMERA TECHNIQUE FOR PROCESS MEASUREMENT ON A RIDGE AND RUNNEL BEACH,
Reading Univ. (England). Dept. of Geology; and Reading Univ. (England). Sedimentology Research Lab.
For primary bibliographic entry see Field 2L.
W77-03325

LARGE SAND WAVES ON THE ATLANTIC OUTER CONTINENTAL SHELF AROUND WILMINGTON CANYON, OFF EASTERN UNITED STATES,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 2L.
W77-03332

MEASUREMENT OF 'TURBIDITY' AND RELATED CHARACTERISTICS OF NATURAL WATERS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-03339

2K. Chemical Processes

THE COMPOSITION OF RAINWATER AT TWO SITES NEAR TOWNSVILLE, QLD. (AUSTRALIA),
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Div. of Soils.
M. E. Probert.
Australian Journal of Soil Research, Vol. 14, No. 3, p 397-402, October 1976. 1 fig, 3 tab, 12 ref.

Descriptors: *Rainwater, *Water chemistry, *Australia, Chemical properties, Ions, Sodium, Chlorides, Calcium, Sulfur, Seasonal, Pollutant identification.
Identifiers: *Townsville(QLD).

Rainwater samples collected over two years at two sites near Townsville have been analysed. The results differ from those obtained at other sites in Australia in that the deposition of sodium and chloride was relatively low, the sodium to chloride ratio was below that of seawater, and the samples were enriched with sulfur and calcium in relation to seawater. A feature of the rainwater composition is the marked seasonal variation in the concentration of all ions, much higher values being obtained in out-of-season rains than during the wet season, but the ionic ratios were not sensitive to the seasonal distribution of rainfall. A common source for the 'excess' ions present in the rainwater could not be established. (CSIRO)
W77-03279

ASPECTS OF THE CHEMICAL VARIABILITY OF SOME TASMANIAN INLAND WATERS (AUSTRALIA),
Tasmania Univ., Hobart (Australia). Dept. of Botany.
R. T. Buckney.

Australian Journal of Marine and Freshwater Research, Vol. 27, No. 3, p. 351-358, September 1976. 5 fig, 2 tab, 14 ref.

Descriptors: *Variability, *Water chemistry, *Surface waters, *Australia, Lakes, Ions, Salinity, Climates, Surveys, Geology, Lake morphology, Pollutant identification.
Identifiers: *Tasmania.

Inland waters may change substantially in chemical content in a short time; variability in total concentration and in the relative proportions of the major dissolved constituents are probably the main factors distinguishing inland waters as chemical systems from oceanic waters. There is, however, little information on the extent to which a water may be expected to vary chemically. A study of 25 Tasmanian waters has described their chemical variability and assessed the main factors contributing to it. The standard deviations of total concentration and ionic concentrations was found to be proportional to a power of the mean concentration. Stoichiometric variability is low in saline waters and can be high in fresh waters. Climate is recognised as being of primary importance as a factor in variability, though morphometric characters exert an influence. Geological conditions are an important factor in determining stoichiometric variability. (CSIRO)
W77-03283

CHEMISTRY OF SALT LAKES AND OTHER WATERS IN THE SUB-HUMID REGIONS OF TASMANIA (AUSTRALIA),
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2H.
W77-03284

STABILITY OF IONIC PROPORTIONS IN FIVE SALT LAKES IN VICTORIA, AUSTRALIA,
Adelaide Univ. (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W77-03285

CHEMICAL COMPOSITION OF SOME INLAND SURFACE WATERS IN SOUTH, WESTERN, AND NORTHERN AUSTRALIA,
Adelaide Univ. (Australia). Dept. of Zoology.
W. D. Williams, and R. T. Buckney.
Australian Journal of Marine and Freshwater Research, Vol. 27, No. 3, p. 379-397, September 1976. 3 fig, 6 tab, 38 ref.

Descriptors: *Surface waters, *Australia, *Saline lakes, *Ions, Salinity, Sodium, Chlorides, Water chemistry, Lakes, Streams, Standing waters.

The results of previous investigations, mainly in Eastern Australia, have established that a major feature of Australian inland waters is high salinity with a predominance of sodium and chloride ions in saline waters. Less evidence has been available on the chemistry of waters in South Australia and Western Australia. Numerous analyses of waters in these areas are presented and discussed. In three areas of South Australia, salinities were high, with sodium and chloride ions dominant; in the southwest of Western Australia, the pattern in both rivers and standing waters was similar, though in this region there were freshwater lakes and streams of low salinities. In running and standing waters of Northern Australia, by contrast, salinities were low and there was no consistent pattern of ionic dominance. (CSIRO)
W77-03286

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN SIMON AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA, AND IN HIDALGO COUNTY, NEW MEXICO--1975,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.

W77-03327

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN BERNARDINO VALLEY AREA COCHISE COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03328

GROUND-WATER QUALITY DATA FOR GEORGIA,
Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03333

BURIED AQUIFERS IN THE BROOTEN-BELGRADE AND LAKE EMILY AREAS, WEST-CENTRAL MINNESOTA--FACTORS RELATED TO DEVELOPING WATER FOR IRRIGATION,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-03335

APPRAISAL OF WATER RESOURCES IN THE HACKENSACK RIVER BASIN, NEW JERSEY,
Geological Survey, Trenton, N. J. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-03336

CHEMICAL COMPOSITION DATA AND CALCULATED AQUIFER TEMPERATURE FOR SELECTED WELLS AND SPRINGS OF HONEY LAKE VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. H. Mariner, T. S. Presser, and W. C. Evans.
Open-file report 76-783, October 1976. 10 p, 1 fig, 4 tab, 10 ref.

Descriptors: *Chemical analysis, *Hot springs, *Groundwater, *Water wells, Gases, Water temperature, Aquifer characteristics, Thermal water, Geochemistry, Water chemistry, Data collections, *California.
Identifiers: *Honey Lake Valley(Calif).

Major element, minor element, and gas composition data are tabulated for 15 springs and wells in Honey Lake Valley, California. Wendel and Amedee hot springs issue Na-SO₄-Cl waters at boiling or near boiling temperatures; the remaining springs and wells issue Na-HCO₃ waters at temperatures ranging from 14 to 33 deg C. Gases escaping from the hot springs are principally nitrogen with minor amounts of methane. The geothermometers calculated from the chemical data are also tabulated for each spring. (Woodward-USGS)
W77-03342

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, AUGUST 1968 - JANUARY 1975,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-03343

SUMMARY OF GEOLOGY AND GROUND-WATER RESOURCES OF PASSAIC COUNTY, NEW JERSEY,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-03345

Field 2—WATER CYCLE

Group 2K—Chemical Processes

GROUND-WATER RESOURCES OF GREELEY AND WICHITA COUNTIES, WESTERN KANSAS.
Geological Survey, Lawrence, Kans. Water Resources Div.; and Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W77-03347

SELECTED DATA ON WATER WELLS, GEOTHERMAL WELLS, AND OIL TESTS IN IMPERIAL VALLEY, CALIFORNIA.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03348

EXPERIMENTAL STUDIES ON MATERIAL TRANSACTIONS BETWEEN MUD AND WATER OF THE GNADENSEE.
For primary bibliographic entry see Field 5C.
W77-03370

EFFECT OF ADDED SALTS ON NITROGEN RELEASED AND NITRATE LEVELS IN FOREST SOILS OF THE WASHINGTON COASTAL AREA.
Western Washington Research and Extension Center, Puyallup.
For primary bibliographic entry see Field 2G.
W77-03396

A MODEL FOR THE CONTROL OF DISSOLVED MANGANESE IN THE INTERSTITIAL WATERS OF CHESAPEAKE BAY.
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 5B.
W77-03556

2L. Estuaries

QUADRATIC FINITE ELEMENTS IN SHALLOW WATER PROBLEMS.
Universidade Federal do Rio Grande do Sul, Porto Alegre (Brazil).
For primary bibliographic entry see Field 8B.
W77-03083

CURRENT STRUCTURE AND MIXING IN THE SHELF/SLOPE WATER FRONT SOUTH OF NEW ENGLAND.
Woods Hole Oceanographic Institution, Mass.
A. D. Voorhis, D. C. Webb, and R. C. Millard.
Journal of Geophysical Research, Vol. 81, No. 21, p. 3695-3708, July 20, 1976. 16 fig. 29 ref. ONR N00014-66-C-0241, N00014-74-C-0262.

Descriptors: *Currents(Water), *Mixing, *Continental shelf, *Atlantic Ocean, Surveys, On-site investigations, On-site data collections, Buoys, Floats, Salinity, Conductivity, Temperature, Water temperature, Ocean currents, Instrumentation, Heat transfer, Oceanography.
Identifiers: Neutrally buoyant floats.

Horizontal and vertical currents in the front along the edge of the continental shelf south of New England during the late spring were measured by tracking special, neutrally buoyant floats which tagged different water masses. The mean current (10-20 cm/s) was westward along the shelf and was confined completely to the overlying shelf water with a geostrophic transport of about 0.7 sverdrups between the 80- and 300-m isobaths. No mean cross-shelf or vertical currents could be reliably measured. Higher frequency currents were detected and were described in this paper. Numerous conductivity-temperature-depth lowerings were made over the drifting floats to examine the interleaving process and possible mixing between

shelf water and slope water. It was found that the layers are thinned by vertical shear, and they gain and lose both heat and salt on a time scale of 1-3 days. This, plus the rich microstructure, suggests the existence of vertical turbulent exchange between layers having a turbulent diffusivity of the order of 5 sq cm s. Estimates of net annual heat and salt input to the shelf were made, and they appear to be significant in determining the heat and salt budget of the shelf water mass. (Sims-ISWS)
W77-03087

EDDY KINETIC ENERGY IN THE DEEP WESTERN NORTH ATLANTIC.
Woods Hole Oceanographic Institution, Mass.
W. J. Schmitz, Jr.
Journal of Geophysical Research, Vol. 81, No. 27, p. 4981-4982, September 20, 1976. 1 fig. 5 ref. ONR N00014-66-C-0241, ONR N00014-74-C-0262.

Descriptors: *Eddies, *Energy, *Atlantic Ocean, Circulation, Water circulation, Ocean circulation, Current meters, Oceans, On-site investigations, Oceanography.
Identifiers: *Eddy energy.

Long-term moored current meter data were used to demonstrate the existence of 2 orders of magnitude of variation for the kinetic energy per unit mass associated with low-frequency fluctuations in the western North Atlantic Ocean at depths near 4000 m. The maximum was observed to be located near the Gulf Stream and the minimum outside of a recently hypothesized deep mean gyre. (Sims-ISWS)
W77-03088

THE BOTTOM BOUNDARY LAYER OF THE DEEP OCEAN.
Woods Hole Oceanographic Institution, Mass.
L. Armi, and R. C. Millard, Jr.
Journal of Geophysical Research, Vol. 81, No. 27, p. 4983-4990, September 20, 1976. 4 fig. 30 ref. ONR N00014-66-C-0241, NSF GX-29054.

Descriptors: *Boundary layers, *Atlantic Ocean, *Salinity, *Temperature, Water temperature, On-site investigations, Mixing, Water circulation, Ocean circulation, Currents(Water), Current meters, Turbulence, Velocity, Oceanography.
Identifiers: *Bottom boundary layer, *Hatteras Abyssal Plain, Profiles.

Some aspects of the bottom boundary layer of the deep ocean were exhibited in profiles of salinity and temperature made with a Woods Hole Oceanographic Institution/Brown CTD microprofiler. Profiles from the center of the Hatteras Abyssal Plain have a signature that is characteristic of mixing a uniformly stratified region. Over rough or sloping topography to the east and west of the abyssal plain, the profiles have more complicated structure. All profiles show a well-mixed layer above the bottom; the penetration height of the layer varies from about 10 to 100 m and is correlated with the one-day mean velocity, inferred from current meters located above the bottom boundary layer. Over the Hatteras Abyssal Plain, the mixed layer extends above the bottom about 6 times the turbulent Ekman layer height. Over rough and sloping topography, the penetration height is between the Ekman layer height and the height observed on the flat abyssal plain. (Sims-ISWS)
W77-03089

HIGH-WAVE CONDITIONS OBSERVED OVER THE NORTH ATLANTIC IN SEPTEMBER 1961.
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
S. K. Chakrabarti.
Journal of Geophysical Research, Vol. 81, No. 27, p. 4991-4994, September 20, 1976. 4 fig. 11 ref.

Descriptors: *Waves(Water), *Ocean waves, *Atlantic Ocean, Storms, Winds, Data processing, Analytical techniques, Energy, Oceans, Ships, Oceanography.
Identifiers: *Spectral analysis, Wave spectra, Wave energy, High-wave conditions.

The Ocean Weather Ship 'Weather Reporter,' underway from the United Kingdom to assume her position at station J (near 53 deg N, 18 deg W) on the North Atlantic, encountered heavy seas over a 4-day period from September 12-15, 1961. The ship measured the sea state during this period with a shipborne wave recorder at 3-hour intervals. The wave energy spectra were computed from these records and were presented in this paper. The upper and lower confidence limits in the estimation of these energy spectra were discussed. Such statistical quantities as the significant wave height and the average period were presented. (Sims-ISWS)
W77-03090

TIME-DEPTH VARIATIONS IN TIDAL FLUX OF SUSPENDED MATTER IN THE SAINT LAWRENCE ESTUARY.
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
B. d'Anglejan, and R. G. Ingram.
Estuarine and Coastal Marine Science, Vol. 4, No. 4, p. 401-416, July 1976. 8 fig. 15 ref.

Descriptors: *Estuaries, *St Lawrence River, *Suspended solids, *Tidal effects, *Canada, Suspended load, Sediments, Sedimentation, Turbidity, Tides, Currents(Water), Water circulation, Settling velocity, Stratification.
Identifiers: *Total suspended matter, *Advection, *Resuspension, Tidal cycles.

An investigation of the factors controlling the variability of suspended matter concentration at different sites in the St. Lawrence River estuary indicated that advection is much more important than local resuspension over the semi-diurnal tidal cycle. This finding is in contrast to that observed in shallower estuaries. All stations exhibit mid-depth maxima in suspended matter concentration. The occurrence of these maxima corresponds approximately to the end of the ebb flow. Variations from this pattern are attributable to large cross channel flow. Calculated values of suspended matter flux were used to explain the time and depth variations of suspended matter concentrations. (Bender-ISWS)
W77-03091

SURF-ZONE WATER QUALITY IN LIVERPOOL BAY.
Lancaster Univ., Bailrigg (England). Lancashire and Western Sea Fisheries Joint Committee.
For primary bibliographic entry see Field 5B.
W77-03092

RAINFALL IN THE SEYCHELLES 1941 TO 1970.
For primary bibliographic entry see Field 2B.
W77-03096

LITTER AND OIL ON THE SHORES OF UT-SIRA, ROGALAND COUNTY, DURING AUTUMN 1974, (IN DANISH).
For primary bibliographic entry see Field 5B.
W77-03125

PLANKTON OF COASTAL LAGOONS: XI. TRANSPORT IN THREE ESTUARIES OF THE NORTHWEST OF MEXICO (NOVEMBER, 1973) (IN SPANISH).
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Biologia.
S. Gomez-Aguirre, and H. Santoyo.
Rev Latinoam Microbiol 17(3), p. 175-183, 1975.

Descriptors: *Phytoplankton, Salinity, Temperature, Estuaries, *Lagoons, *Mexico, Tides, Zooplankton, Water temperature.
Identifiers: Coastal lagoons.

The seastuary interaction was examined through studies of the transport of plankton in 3 neighboring tropical estuaries. Continuous observations and sampling were carried out in the entrances of the lagoons throughout complete tidal cycles. Salinity was proportional to the flux but water temperature exhibited a reversed pattern. The amount of phytoplankton was low when the tide was high and concentrations of zooplankton were high. Information on the qualitative and quantitative variation of plankton are presented for each estuary.—Copyright 1976, Biological Abstracts, Inc.
W77-03145

CALIBRATION OF A THERMAL ENRICHMENT MODEL FOR SHALLOW, BARRICADED ESTUARIES,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 5B.
W77-03171

TOXICITY OF NO. 2 FUEL OIL TO COON STRIPE SHRIMP,
Battelle Pacific Northwest Labs., Sequim, Wash. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W77-03186

EFFECTS OF OIL POLLUTION ON BREEDING GREY SEALS,
West Wales Naturalist Trust, Haverfordwest (England).
For primary bibliographic entry see Field 5C.
W77-03187

IMMEDIATE INDUSTRIAL EFFECTS ON SEDIMENT MERCURY CONCENTRATIONS IN A CLEAN COASTAL ENVIRONMENT,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W77-03188

PELAGIC TAR IN THE NORWEGIAN COASTAL CURRENT,
Institute of Marine Research, Bergen (Norway).
For primary bibliographic entry see Field 5B.
W77-03190

DISTRIBUTION AND SOURCE OF TAR ON THE PACIFIC OCEAN,
Department of the Environment, Victoria (British Columbia). Ocean Chemistry Div.
For primary bibliographic entry see Field 5B.
W77-03191

EFFECTS OF OIL ON BEACHES IN WEST CORK, IRELAND,
University Coll., Cork (Ireland). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-03192

INFLUENCE OF ILLUMINATION ON PHYTOXICITY OF CRUDE OIL,
Museum National d' Histoire Naturelle, Paris (France). Laboratoire de Physiologie Generale et Comparee.
For primary bibliographic entry see Field 5C.
W77-03193

THE EFFECT OF OIL POLLUTION IN BANTRY BAY,
University Coll., Cork (Ireland). Dept. of Botany.

For primary bibliographic entry see Field 5C.
W77-03194

OLYMPIC ALLIANCE OIL SPILLAGE,
Oil Pollution South East Kent, Dover (England).
For primary bibliographic entry see Field 5C.
W77-03195

TOXICITY OF CRUDE OILS AND A DISPERSANT TO THE STONY CORAL MADRACIS MIRABILIS,
Caraibisch Marien-Biologisch Instituut, Curacao (Netherlands, Antilles).
For primary bibliographic entry see Field 5C.
W77-03196

DESTRUCTIVE GRAZING OF KELP BY SEA URCHINS IN EASTERN CANADA,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-03199

PHYTOPLANKTON ECOLOGY IN VALPARAISO BAY: III. PHYTOPLANKTON FROM 1972-73, (IN SPANISH),
Chile Univ., Valparaiso. Departamento de Oceanologia.
For primary bibliographic entry see Field 5C.
W77-03200

CURRENT MEASUREMENTS IN THE BEAUFORT SEA,
Washington Univ., Seattle. Dept. of Oceanography.
K. Aagaard, and D. Haugen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 11-21, April 1976. 2 fig. 03-5-033-67.

Descriptors: *Alaska, *Ocean currents, *Ocean circulation, *Circulation, *Oil spills, *Oil pollution, *Water pollution, *Resources development, *Baseline studies, *Environmental effects, Time series analysis, Ice cover, Arctic Ocean, Dispersion.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, Petroleum resources, Current measurements, Beaufort Sea.

The general objective of this research is to provide long-term Eulerian time series of currents at selected locations on the outer shelf and slope of the Beaufort Sea, so as to describe and understand the circulation and dynamics of the outer shelf and slope. The time series must be long enough to define the important temporal scales of motion. The area is ice-covered throughout the year, so that the specific objective must be to recover the current measurements from anchored arrays despite the presence of ice. Long-term direct current measurements are necessary to describe and understand the circulation on the shelf and the exchange between the shelf and the deep Arctic Ocean. This circulation and exchange are physical mechanisms which transport and disperse pollutants and substances of biological and geological importance. The water motion also influences the ice distribution. (Sinha-OEIS)
W77-03228

EFFECTS OF SEASONABILITY AND VARIABILITY OF STREAMFLOW ON NEARSHORE COASTAL AREAS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W77-03229

NUMERICAL STUDIES OF ALASKAN REGION,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03231

STD MAPPINGS OF THE BEAUFORT SEA SHELF,
Washington Univ., Seattle. Dept. of Oceanography.
K. Aagaard.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 249-266, April 1976. 7 fig, 2 tab. 03-5-022-67.

Descriptors: *Alaska, *Arctic Ocean, *Ocean circulation, *Ocean currents, *Resources development, *Baseline studies, *Environmental effects, *Water pollution, *Mapping, Seasonal, Advection, Circulation.
Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, Oil development, Beaufort Sea, Canadian Basin, Pycnocline.

Through a series of CTD sections across the Beaufort Sea shelf the seasonal hydrographic sequence was traced through the fall and winter. Several features all combine to strongly suggest that beginning in the fall, the north Alaskan shelf is in fact feeding water into the pycnocline region of the Arctic Ocean and contributing to the temperature structure which is characteristic of the lower Arctic Water of the entire Canadian Basin. Oceanographically, the Beaufort shelf is much like the deep Canadian Basin, however, it appears that there is a regard in which the Beaufort shelf is of distinct and considerable oceanographic significance, viz. that it very likely constitutes a source of subsurface waters for the Canadian Basin. Should this be the case, it can possibly spread a variety of substances from the shelf into the Arctic Ocean pycnocline. In other words, spreading from the shelf is not necessarily confined to the surface layers. (Sinha-OHS)
W77-03233

PHYSICAL OCEANOGRAPHY OF THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5B.
W77-03241

NEAR-SHORE ATMOSPHERIC MODIFICATION,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03242

A SEISMOTECTONIC STUDY OF SEISMIC AND VOLCANIC HAZARDS IN THE PRIBILOF ISLANDS - EASTERN ALEUTIAN ISLANDS REGION OF THE BERING SEA,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
J. N. Davies, L. House, K. H. Jacob, R. Bilham, and V. F. Cormier.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 1-86, April 1976. 21 fig, 5 tab, 17 ref, append. 03-5-022-70 and ERDA (11-1)3134.

Descriptors: *Alaska, *Seismic properties, *Hazards, *Earthquakes, *Baseline studies, *Resources development, *Environmental effects, *Seismic studies, *Cold regions, Volcanoes, Geophysics, Organic compounds.

Field 2—WATER CYCLE

Group 21—Estuaries

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Prifilof Islands, Bering Sea.

This report presents: (1) historic seismicity maps of the Shumagin seismic gap vicinity which show the relatively low level of seismic activity in the gap, a possible offset in the Benioff zone, and a few events associated with the Bering shelf continental margin south of the Prifilof Islands; (2) a seismicity map and hypocenter cross-sections based on data from the local Shumagin Islands seismic network which show a very well developed Benioff zone beneath the Shumagin Islands; (3) studies of the focal mechanisms of April 6, 1974 Shumagin Islands earthquake and the February 2, 1975 Near Islands earthquakes which respectively show thrust faulting perpendicular to the arc and right-lateral strike-slip faulting oblique to the arc along the slip direction inferred from the relative motion of the plates; (4) the first strong motion accelerograph data from the eastern Aleutians, which show accelerations consistent with those observed for earthquakes in California; (5) this year's geodetic leveling results which when compared with those from 1972 indicate that regional tilting due to tectonic strain accumulation, if it is occurring, is less than 1.9 microradians per year; and (6) seismic observations of two Strombolian eruptive cycles of Pavlov Volcano which reveal monochromatic wave trains which are identical one to the next suggesting a common source region and a harmonic source function or very efficient filtering of body waves by the pyroclastic layers of the volcano. (Sinha-OEIS) W77-03243

COASTAL MORPHOLOGY AND SEDIMENTATION, GULF COAST OF ALASKA (GLACIAL SEDIMENTATION),
Rhode Island Univ., Kingston, Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-03244

COASTAL DYNAMICS AND SEDIMENT TRANSPORTATION, NORTHEAST GULF OF ALASKA,
South Carolina Univ., Columbia. Dept. of Geology.
D. Nummedal, and M. F. Stephen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 214-373, April 1976. 53 fig, 6 tab, 16 ref. Also as South Carolina University Technical Report No. 9-CRD. 03-5-022-82.

Descriptors: *Alaska, *Sediment transport, *Bathymetry, *Environmental effects, *Cold regions, *Weather data, Morphology, Ocean currents, Organic compounds.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Wave climates, *Wave refraction, *Wave energy, Coastal dynamics, Longshore currents, *Gulf of Alaska.

Analysis of the climatology and physical oceanography of the northeast Gulf of Alaska provides a predictive model for wave height and longshore sediment transportation along the coastline between Yakutat and Cape Suckling. The relationships between the offshore wave climate, the bathymetrically controlled patterns of refraction and the resulting shoreline variability in physical processes have been emphasized. Field observations of coastal morphology, sediment dispersal trends and breaker parameter variability were made in July and August of 1975. Despite the absence of many major storm episodes during the field season, the observed processes correlate well with the sediment distribution in all environments except on high-level storm berms and washover terraces at the east Malaspina Foreland where occasional storms induce a sediment transport direction opposite to that of the dominant conditions. The wave climate model and field observa-

tions demonstrate a general westward transport of sediment on the exposed beaches of the northeast Gulf of Alaska. Reversals of this trend are observed on the west side of Icy Bay and Yakutat Bay where the net transport direction is towards the northeast, i.e., towards the head of the bays. As an introduction to the study area figures provide a LANDSAT-satellite view and seven high-altitude oblique air photos of the coastal zone from Cape Yakutat to Yakutat Bay. (Sinha-OEIS) W77-03245

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN,
Alaska Univ., College. Dept. of Geology.
P. J. Cannon.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 373-390, April 1976. 1 fig, 1 tab, 4 ref. 03-5-022-56.

Descriptors: *Alaska, *Geomorphology, *Coastal plains, *Water pollution, *Hazards, *Baseline studies, *Resources development, *Environmental effects, *Cold regions, Radar, Earthquakes, Mapping, Organic compounds.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Gulf of Alaska, Radar imagery, *Environmental geology.

The purpose of the study was to produce information which can be used in an environmental assessment of the coastal plain section of the Gulf of Alaska, in relation to possible oil and gas development and to evaluate radar imagery as a major information source for environmental geological mapping. It was found that radar imagery is an adequate tool to use in the environmental evaluations of diverse types of coasts. X-band, real aperture radar imagery of the Gulf of Alaska coastal plain is adequate both as a mapping base and as a source of important environmental geologic data. The radar imagery of the Gulf of Alaska coastal plain indicates that severe environmental geologic hazards, such as earthquakes, surface movements along active faults, and outburst floods, have occurred recently and will continue to occur with a relatively high frequency. Natural processes are modifying parts of the coastal plain at a relatively rapid rate. (Sinha-OEIS) W77-03246

DELINEATION AND ENGINEERING CHARACTERISTICS OF PERMAFROST BENEATH THE BEAUFORT SEA,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W77-03247

DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE GULF OF ALASKA AND SOUTHEASTERN BERING SHELF,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
R. A. Feely, and J. D. Cline.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 467-484, and 409-466 (pages placed in wrong order), April 1976. 30 fig, 2 tab, 30 ref.

Descriptors: *Alaska, *Sediment transport, *Resources development, *Baseline studies, *Environmental effects, *Water pollution, *Pollutants, Suspended solids, Sedimentation, Oil pollution, Organic compounds.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Gulf of Alaska, *Bering Sea, Seasonal variations.

Particles suspended in seawater play a major role in regulating the chemical forms, distributions and ultimate deposition of many marine pollutants. Some toxic substances in particulate form are transported to the oceans where they are desorbed at the freshwater-seawater interface. Other substances (particularly petroleum hydrocarbons) are adsorbed onto the surface of suspended particles and are removed to the sediments as the particles settle. The major objective of the particulate matter program in the Gulf of Alaska and southeastern Bering Shelf is to determine the seasonal variations in the distribution, composition, and transport of suspended matter. Other objectives include: (1) the high frequency (hourly) variability in the distribution of suspended matter, and (2) the investigation of the role of resuspension processes as a mechanism for redistribution of sedimentary materials. Preliminary conclusions indicate that surface suspended matter distributions of the southeastern Bering Shelf appear to follow the general pattern of circulation in Bristol Bay. Suspended material from the northern rivers is generally carried to the west and southwest by the counterclockwise currents. In the Gulf of Alaska the distribution of suspended matter at the surface appears to follow the general pattern of circulation in the Gulf of Alaska. Studies of the temporal variability of suspended matter near the bottom indicate that resuspension processes may be occurring. (Sinha-OEIS) W77-03248

OFFSHORE PERMAFROST STUDIES, BEAUFORT SEA,
Geological Survey, Menlo Park, Calif.
P. Barnes, D. Carter, D. Drake, D. Hopkins, and A. Lachenbruch.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 485-511, April 1976. 3 fig, 54 ref.

Descriptors: *Alaska, *Permafrost, *Cold regions, *Baseline studies, *Resources development, *Water pollution, *Environmental effects, *Hazards, Sediments, Natural resources.
Identifiers: *Outer Continental Shelf, *Offshore drilling, Oil exploration, Oil development, *Beaufort Sea, Seismic data, Sand and gravel resources, Engineering properties.

A knowledge of the distribution of deep ice-rich permafrost is fundamental to engineering problems related to offshore drilling and oil production and to the interpretation of seismic data for resource studies. Permafrost has a marked influence on the engineering properties of soils, and probably of marine sediments. Ice gouging of the sea floor commonly exposes semi-consolidated sediments and creates metastable gouge ridges. Thus, the engineering properties of surface and subsurface shelf sediment need to be assessed, so that potential hazard to offshore construction may be determined. Sand and gravel are essential construction materials for drill pads, air strips, roads and offshore islands. In the Prudhoe Bay area, materials are now obtained from the river channels and from the offshore islands, where the gravel has apparently been reconcentrated from the Gubik Formation. In the vicinity of Barrow the Gubik Formation has little gravel and this building material is in short supply. As a result, the potential for the offshore sand and gravel resources needs to be evaluated. (Sinha-OEIS) W77-03249

MARINE ENVIRONMENTAL PROBLEMS IN THE ICE COVERED BEAUFORT SEA SHELF AND COASTAL REGIONS,
Geological Survey, Menlo Park, Calif.
P. Barnes, E. Reimnitz, and D. Drake.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology,

p 512-590, April 1976. 10 fig, numerous tab, 14 ref. RK6-6074.

Descriptors: *Alaska, *Ice cover, *Cold regions, *Resources development, *Baseline studies, *Environmental effects, *Oil pollution, *Permafrost, Coasts, Pipelines, Pollutants, Organic compounds.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, Offshore drilling, Arctic Ocean, *Beaufort Sea.

The primary goal of the program has been to understand the processes that are unique to Arctic shelves and their sedimentary environment, where sea ice plays an important role. Specific objectives have included: a definition of the character of bottom materials, including permafrost; a study of the present sediment transport and depositional mechanisms; and studies of the Holocene and Pleistocene geologic record. The character of the arctic continental shelf and coastal area, with its permafrost, faces the developer with many special problems. Any structure which is to be connected to the ocean floor requires data concerning the strength and character of the ocean floor. In addition, the offshore drilling operation may encounter permafrost which would be substantially altered during the process of pumping hot oil up to the sea floor or along the sea floor in gathering and transportation pipelines. The interaction of the arctic shelf with the arctic pack ice takes the form of ice gouging and the formation of a large stamukhi zone each winter. These factors are of utmost importance to the designers and operators of offshore terminals and pipelines. (Sinha-OEIS) W77-03250

SURFACE CURRENT OBSERVATIONS - BEAUFORT SEA, 1972.

Geological Survey, Menlo Park, Calif.
P. Barnes, and R. Garlow.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 591-599, April 1976. 6 ref. Also as U.S.G.S. Open File Report No. 75-619.

Descriptors: *Alaska, *Ocean currents, *Ocean circulation, *Sediment transport, Pollutants, Water pollution, *Baseline studies, *Resources development, *Environmental effects, Ice, Sea ice, *Path of pollutants.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Beaufort Sea, Surface currents, Drift cards.

Sediment transport via water and ice in the Beaufort Sea off northern Alaska is related to the movement of the surficial waters. As development proceeds along the north slope of Alaska, a knowledge of the potential drift trajectories of water, ice, sediment and pollutants will be needed. In an attempt to better define the probable paths and rates of transport, 4200 surface drift cards were dropped during the U.S. Coast Guard WEBSEC cruise of August and September, 1972. The results of this release are the subject of this report. Because the data presented here will be used primarily by those interested in solving problems of transport, the emphasis has been placed on data presentation rather than a detailed analysis of the circulation. (Sinha-OEIS) W77-03251

HEAVY-MINERAL TRENDS IN THE BEAUFORT SEA.

Geological Survey, Menlo Park, Calif.
G. Luepke.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 641-676, April 1976. 6 fig, 6 tab, 45 ref. Also as U.S.G.S Open-file Rept 75-667.

Descriptors: *Alaska, *Resources development, *Baseline studies, *Sediment transport, Sediments, *Heavy metals, Geology, *Mineralogy, Path of pollutants.

Identifiers: *Outer Continental Shelf, *Beaufort Sea, North Slope, Pack ice, *Heavy minerals.

Sediments of the Beaufort Sea, off the North Slope of Alaska contain a great variety of heavy minerals. These include garnet, chrome spinel, augite, pigeonite, diopside, hornblende, enstatite, hypersthene, epidote, clinzoisite, zoisite, apatite, tourmaline, chloritoid, sphene, zircon, and opaque minerals. Much rarer constituents are glaucophane, lamprophyllite, rutile, kyanite, staurolite, and riebeckite. Carnet increases in abundance from east to west which corresponds to a similar increase in garnet abundance in coastal outcrops of the Gubik Formation sands. Only garnet and iron-stained aggregates appear to have source-related distribution patterns. The other heavy minerals lack distinct distributive provinces, reflecting an environment dominated by intense mixing by ice-gouging and bioturbation and a homogenous source area. Waves and currents are not strong enough to sort sediments at depths greater than 10 m except during summer storms. The source of the Beaufort Sea heavy minerals is dominated by contributions from the Alaskan North Slope deposits of Tertiary and younger age. The Colville River, largest in the region, is probably the most influential in transporting sediments, but because of wave and current-mixing of sediments on the shelf, exact contributions from each river drainage cannot be ascertained. Coastal erosion of the Gubik Formation is probably at least as important as the Colville River in supplying heavy minerals to the Beaufort Sea. (Sinha-OEIS) W77-03254

YUKON DELTA COASTAL PROCESSES STUDY.

Wesleyan Univ., Middletown, Conn. Dept. of Earth and Environmental Sciences.

W. R. Dupre, and D. M. Hopkins.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 5-40, April 1976. 10 fig.

Descriptors: *Alaska, *Oil spills, *Oil pollution, *Offshore platforms, Water pollution, *Baseline studies, Environmental effects, *Resources development, Hazards, *Deltas, Estuaries, Pipelines, Storms, Permafrost, Organic compounds.

Identifiers: *Outer Continental Shelf, *Oil exploration, *Oil development, *Coastal processes, *Offshore drilling, Bering Sea, Yukon River, Shorefast ice, Drilling platforms, Coastal stability.

Much of the Yukon delta is underlain by the on-land extension of the Nunivak Arch; this would seem to exclude most of the region for serious consideration for exploration. Nevertheless, the Quaternary faults and volcanoes which characterize the zone constitute serious geologic constraints on the selection of transportation corridors. The discontinuous permafrost and the complex hydrology of the delta further complicate the location of such corridors, as well as making it difficult to predict the effects of oil spills. The selection of shoreline sites (e.g. docking and pipeline terminals) must take into account the present coastal stability, including the possibility of erosion associated with major storm surges, even in an area of long-term progradation. In addition, the effects of shorefast ice for over half of the year must be considered. The siting of offshore facilities (e.g., drilling platforms, underwater pipelines) must take into account the extent and variability of shorefast ice, the possibility (as yet unproven) of offshore permafrost, and the possible effects of altering offshore bathymetry in changing coastal stability. In addition, the effects of possible oil spills must take into account not only the dominant

northward drift of water and sediments, but also the local and seasonal variability of current patterns. (Sinha-OEIS) W77-03255

FAULT HISTORY OF THE PRIBILOF ISLAND AND ITS RELEVANCE TO BOTTOM STABILITY IN THE ST. GEORGE BASIN.

Geological Survey, Menlo Park, Calif.
D. M. Hopkins.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 41-67, April 1976. 7 fig, 12 ref.

Descriptors: *Alaska, *Pipelines, *Hazards, *Earthquakes, *Faults(Geologic), *Oil spills, *Oil pollution, *Baseline studies, *Resources development, Environmental effects, Water pollution.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Pribilof Sound, Bottom stability, *St. George Basin, Fault history.

This study evaluates frequency of faulting and volcanic eruptions on the Pribilof Islands and in nearby waters, examines rates and directions of changes in the island shorelines during the 20th Century, and investigates the nature of the soils and their susceptibility to erosion after disturbance. Volcanos have been active in the Pribilof Island area throughout the last 8 m.y., activity during the last 300,000 years has been confined to the vicinity of St. Paul Island. Eruptions recur at intervals of about 10,000 years. Faulting is also an ongoing process. Fault movements recur at rather long but still unknown intervals. Although the recurrence interval of movement on individual faults is long, the fault hazard is significant, because faults cross any possible path for a pipeline connecting production areas in the St. George Basin with terminal facilities on the Pribilof Islands. The sandy beaches and sandy soils of St. Paul Island are sensitive to human activity. Perturbations related to construction of logistic bases and pipeline and transhipment facilities are likely to result in extensive changes in the beaches and loss of surface soils by wind deflation. (Sinha-OEIS) W77-03256

EARTHQUAKE ACTIVITY AND GROUND SHAKING IN AND ALONG THE EASTERN GULF OF ALASKA.

Geological Survey, Menlo Park, Calif. Office of Earthquake Studies.
J. C. Lahr, and R. A. Page.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 69-90, April 1976. 11 fig, 10 ref.

Descriptors: *Alaska, *Hazards, *Seismic studies, *Earthquakes, *Faults(Geologic), *Coastal structures, *Oil spills, *Oil pollution, *Baseline studies, *Resources development, Environmental effects, Water pollution, Leases, Organic compounds.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Gulf of Alaska, Fault history, Offshore structures.

Work completed at this time indicates that the seismic hazard is extreme in the eastern Gulf of Alaska. Continued seismic monitoring will no doubt reveal other areas of activity and delineate other active geologic structures. It is crucial that the potential seismic hazards in the eastern Gulf of Alaska be carefully analyzed and that the results be incorporated into the plans for future petroleum development. This information should be considered in the selection of tracts for lease sales, in choosing the localities for landbased operations, and in setting minimum design specifications for both coastal and offshore structures. (Sinha-OEIS) W77-03257

Field 2—WATER CYCLE

Group 2L—Estuaries

EROSION AND DEPOSITION OF SHELF SEDIMENT: EASTERN GULF OF ALASKA, Geological Survey, Menlo Park, Calif. B. F. Molnia, and P. R. Carlson.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 91-105, April 1976. 8 ref.

Descriptors: *Alaska, *Sedimentation, *Sediment transport, *Resources development, *Baseline studies, Environmental effects, Water pollution, *Oil pollution, Erosion, Deposition, Offshore platforms.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Gulf of Alaska, Artificial structures.

The continental shelf of the eastern Gulf of Alaska is in a dynamic environment. Rivers and streams carry vast quantities of glacial silt and clay to this shelf, which is affected by strong longshore currents, frequent high energy storm waves, and occasional seismic sea waves (tsunamis). If this area is to be considered safe for petroleum production, the sediments found here must be carefully studied and all characteristics thoroughly understood. The movement of sediment is a vital consideration in any decision as to where to place artificial structures, such as those used by the petroleum industry, to ensure maximum safety. (Sinha-OEIS) W77-03258

FAULTING AND INSTABILITY OF SHELF SEDIMENTS: EASTERN GULF OF ALASKA, Geological Survey, Menlo Park, Calif. P. R. Carlson, and B. F. Molnia.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 107-124, April 1976. 7 fig.

Descriptors: *Alaska, *Hazards, *Environmental effects, *Baseline studies, *Resources development, Water pollution, Sediments, Faults(Geologic), Organic compounds. Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Gulf of Alaska, Slumps, Submarine slides.

Faults and submarine slides or slumps are potential environmental hazards on the outer continental shelf of the northern Gulf of Alaska. Submarine slides or slumps have been found in two places in the OCS region: (1) seaward of the Malaspina Glacier and Icy Bay, an area of 1,770 square kilometers, that has a slope of less than one-half degree, and (2) across the entire span of the Copper River prodelta, an area of 1,730 square kilometers, that has a slope of about one-half degree. Seismic profiles across these areas show disrupted reflectors and irregular topography commonly associated with submarine slides or slumps. Other potential slide or slump areas have been delineated in areas of thick sediment accumulation and relatively steep slopes. These areas include Kayak Trough, parts of Hinchinbrook Entrance and Sea Valley, parts of the outer shelf and upper slope between Kayak Island and Yakutat Bay and Bering Trough. (Sinha-OEIS) W77-03259

SEISMIC AND VOLCANIC RISK STUDIES - WESTERN GULF OF ALASKA, Alaska Univ., College. Geophysical Inst. H. Pulpan, and J. Kienle.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 125-137, April 1976. 1 fig, 1 tab. 03-5-022-55.

Descriptors: *Alaska, *Volcanoes, *Seismic studies, *Tsunamis, *Oil pollution, *Water pollution, *Baseline studies, *Resources development, *Environmental effects, Hazards, Organic compounds.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Gulf of Alaska, Offshore structures.

The purpose of the study was to assess seismic and volcanic risk in the western Gulf of Alaska, primarily from seismic data. Eight new seismic stations were installed in the study area to provide a higher resolution than previously existed. Data analysis of existing seismic data and the new seismic network is in progress. Several major eruptions occurred on Augustine Island during the report period and seismic data from before and during the eruption are being analyzed. Consequences of seismic and volcanic activity such as severe ground displacements, tsunami run-ups will put severe strains of offshore and onshore structures, erected in connection with petroleum development. Ash falls, volcanic heat and pressure waves, mudflows and fast moving glowing clouds near active volcanoes will endanger equipment and crews. This study will provide pertinent input parameters toward deciding where to put these structures and what design criteria to use. (Sinha-OEIS) W77-03260

OFFSHORE PERMAFROST-DRILLING, BOUNDARY CONDITIONS, PROPERTIES, PROCESSES AND MODELS, Alaska Univ., College. Geophysical Inst.

For primary bibliographic entry see Field 5B. W77-03261

BEAUFORT SEACOAST PERMAFROST STUDIES, Alaska Univ., College. Geophysical Inst.

For primary bibliographic entry see Field 2C. W77-03262

BENTHOS-SEDIMENTARY SUBSTRATE INTERACTIONS, Alaska Univ., College. Inst. of Marine Science.

For primary bibliographic entry see Field 5C. W77-03263

FAULTING AND INSTABILITY OF SHELF SEDIMENTS - WESTERN GULF OF ALASKA, Geological Survey, Menlo Park, Calif. M. A. Hampton, and A. H. Bouma.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 307-339, April 1976. 8 fig, 1 tab, 22 ref.

Descriptors: *Alaska, *Sediments, *Water pollution, *Baseline studies, *Resources development, *Environmental effects, *Hazards, *Oil pollution, Faults(Geologic), Pollutants.

Identifiers: *Outer Continental Shelf, Petroleum resources, Oil exploration, Oil development, *Gulf of Alaska, Kodiak Island.

Surface faulting has been identified in a zone along and offshore of the southeast coast of Kodiak Island, extending northeast to Montague Island. Scattered surface faults also exist on Albatross Bank, near the edge of the continental shelf. Movement along the surface faults could affect OCS resource activities near them. No major zones of slumping have been discovered so far, although some might exist on the sloping sides of major sea valleys where quantities of fine-grained sediment are accumulating. The major sea valleys appear to be likely dispersal routes for contaminated sediments, and some local storage of these sediments also is possible in the valleys. Attention is being directed mainly to the proposed area of federal OCS oil and natural gas lease sale no. 46. The results of this study can be used to identify areas where geologic conditions adverse to resource development exist and to determine the regional dispersal patterns and storage sites of contaminants introduced into marine sediments. (Sinha-OEIS)

W77-03264

A HISTORICAL SUMMARY OF EARTHQUAKE EPICENTERS IN AND NEAR ALASKA, National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.

For primary bibliographic entry see Field 7C. W77-03265

A STUDY OF BEAUFORT SEA COASTAL EROSION - NORTHERN ALASKA, R. Lowellen.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 417-427, April 1976. 03-6-022-35126.

Descriptors: *Alaska, *Sediments, *Erosion, *Deposition, *Hazards, *Baseline studies, *Resources development, *Environmental effects, Water pollution, Oil pollution, Coasts. Identifiers: *Outer Continental shelf, Petroleum resources, Oil exploration, Oil development, *Beaufort Sea, Coastal morphology.

The purpose of this project was to evaluate present rates of change in coastal morphology, with particular emphasis on rates and patterns of man-induced changes and to locate areas where coastal morphology is likely to be changed by man's activities and evaluate the effect of these changes, if any. Preliminary results suggest that the coastline is definitely eroding in permafrost terrain; and in other cases permafrost is rapidly aggrading in areas of recent deposition. (Sinha-OEIS) W77-03266

THE INTERACTION OF OIL WITH SEA ICE IN THE ARCTIC OCEAN, Washington Univ., Seattle. Dept. of Oceanography.

For primary bibliographic entry see Field 5C. W77-03267

DYNAMICS OF NEAR-SHORE ICE, Cold Regions Research and Engineering Lab., Hanover, N. H. For primary bibliographic entry see Field 2C. W77-03268

DYNAMICS OF NEAR-SHORE ICE (DATA BUOYS), Washington Univ., Seattle. Dept. of Atmospheric Sciences. For primary bibliographic entry see Field 2C. W77-03269

STUDY OF CLIMATIC EFFECTS ON FAST ICE EXTENT AND ITS SEASONAL DECAY ALONG THE BEAUFORT SEA COAST, Colorado Univ., Boulder. Inst. of Arctic and Alpine Research. For primary bibliographic entry see Field 2C. W77-03270

MECHANICS OF ORIGIN OF PRESSURE RIDGES, SHEAR RIDGES AND HUMMOCK FIELDS IN LANDFAST ICE, Alaska Univ., College. Geophysical Inst. L. H. Shapiro, and W. D. Harrison.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 117-153, April 1976. 6 fig, 15 ref. 03-5-022-55.

Descriptors: *Alaska, *Arctic Ocean, *Drilling, *Baseline studies, *Environmental effects, *Resources development, *Offshore platforms, Hazards, Oil spills, Oil pollution, Water pollution, Deformation.

Identifiers: *Outer Continental Shelf, *Landfast ice, *Offshore structures, *Ice forces, *Pressure ridges, *Shear ridges, Hummock fields, Oil development, Oil exploration.

The goal of this project is to develop an understanding of the forces and mechanisms involved in the formation of pressure ridges, shear ridges and hummock fields in the near shore zone, and the environmental parameters which cause these features to occur in particular areas. When these results are available, it may prove possible to develop procedures through which average and worst possible occurrences of heavily deformed ice at various localities can be predicted. It can reasonably be expected that early drilling offshore from the barrier islands along the Arctic coast will occur within the area seasonally covered by landfast ice. Siting of drilling platforms to avoid potential ridging sites where possible, or to compensate for the higher forces through design changes, thus depends upon a capability to predict the severity of the deformation to be expected at any point. Some preliminary conclusions are: Forces approaching the crushing strength of sea ice may be reached during the growth of grounded pressure ridges; the approximate coincidence of the bounding shear ridge of landfast ice with the 20m depth contour may be explainable in terms of the maximum forces which pack ice approaching the coast at low-angle can exert against the landfast ice edge; and the ability of the ice sheet to bend and still maintain continuity should be considered in the design of structures such as gravel or ice islands. (Sinha-OEIS)

W77-03271

MORPHOLOGY OF BERING NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING,
Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.
W77-03272

OPERATION OF AN ALASKAN FACILITY FOR APPLICATIONS OF REMOTE-SENSING DATA TO OCS STUDIES,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 7B.
W77-03277

NATURE AND GENESIS OF SOME STORM WASHOVER DEPOSITS,
Coastal Engineering Research Center, Fort Belvoir, Va.
R.K. Schwartz.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-021 057, Price codes: A04 in paper copy, A01 in microfiche. Technical Memorandum No. 61, December 1975. 69 p, 32 fig, 3 tab, 47 ref, 2 append.

Descriptors: *Beach erosion, *Sedimentation, *Coasts, *Atlantic Ocean, *Lake Erie, Dunes, Sand spits, Storms, Waves(Water), Oceans, Lakes, Sands, Sediments, Beaches, Shores, Barrier islands, Sedimentology.
Identifiers: *Washover deposits, *Outer Banks(NC), *Presque Isle(Pa), Barrier morphology, Littoral processes.

Freshly formed small-scale washover deposits were examined along a section of the Atlantic coast (Outer Banks, North Carolina) and Lake Erie (Presque Isle Peninsula, Pennsylvania) to determine their stratigraphic properties, mode of placement, and relationship to adjacent barrier (spit) morphology. Storm washover occurrence is a function of the degree of storm surge and backshore-foredune relief. The shape and dimension of the resulting washover sand body is largely controlled by surrounding topography. Overall textural distribution, modality and skewness of sediment samples from the adjacent washover,

foredune, and beach show a strong similarity. Modality is related to texture subpopulation, while skewness reflects subpopulation mixing. Normal and inverse grading as well as textural coarsening in the presumed direction of washover flow are distinctive trends. Storm washover results from the deposition of sediment carried in a succession of unidirectional, discontinuous surges which flow past the berm, or foredune line, and downslope across the washover surface. Flow velocities imparted by the initial fluid surge coupled with downslope gravity effects facilitate the development of flow similar to sediment gravity flow. In some cases, added shear stress imposed on a sediment-concentrated bed layer by the overlying fluid results in the development of grain flow, a type of sediment gravity flow. Washover contributes to landward and vertical accretion of relatively coarse detritus in the barrier environment, thus serving as temporary sediment sink in an erosional (transgressive) littoral drift system. (Sims-ISWS)

W77-03293

EFFECTS OF A BREAKWATER ON NEARSHORE CURRENTS DUE TO BREAKING WAVES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-03297

FLOW DYNAMICS OF THE NEUSE RIVER ESTUARY,
North Carolina State Univ., Raleigh. Dept. of Geosciences.
C.E. Knowles.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 748, Price codes: A08 in paper copy A01 in microfiche. Sea Grant Publication UNC-SG-75-16, August 1975. 146 p, 3 fig, 1 tab, 7 ref, 6 append. NOAA 04-3-158-40.

Descriptors: *Estuaries, *Rivers, *Water circulation, *North Carolina, Circulation, Flow, River flow, Winds, Temperature, Water temperature, Tides, Tidal effects, Tidal waters, Coasts, Currents(Water), On-site investigations, Sampling, Computer programs, Data processing.
Identifiers: *Neuse River(NC), *Pamlico Sound(NC).

A 38-day definitive study of the Neuse River circulation was undertaken from 7 August to 14 September 1973. From this study the following conclusions can be made: (1) The net circulation in the river is slow and complicated (circular flow patterns across river and return flow upstream). A rough estimate of the mean net flow for the river is 1.81 cm/sec, and the corresponding transit time for water starting near New Bern and entering Pamlico Sound is 32 days. Because of the complicated crossstream, upstream flow, waste materials could remain in a local area for a time considerably longer than that predicted by the rough transit time included above. (2) Lunar tides may be the driving mechanisms for the observed circulation at all stations upstream from Pamlico Sound. All the upstream stations have a near tidal period in the upstream, downstream current fluctuations. Only one of two stations at the mouth of the river does not have a significant semi-diurnal component in its flow. (3) The winds usually tend to enhance the river circulation. They are generally diurnal (land breeze in morning, sea breeze in afternoon) and seem to have the largest effect on flow at the station located at the river mouth, but these effects may be indirect; i.e., they may be due to Pamlico Sound circulation which is generally understood to be wind-driven. (Sims-ISWS)

W77-03300

JOINT PROBABILITY METHOD OF TIDE FREQUENCY ANALYSIS APPLIED TO

APALACHICOLA BAY AND ST. GEORGE SOUND, FLORIDA,
National Weather Service, Silver Spring, Md. Office of Hydrology.

F.P. Ho, and V.A. Myers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 123, Price codes: A04 in paper copy, A01 in microfiche. NOAA Technical Report NWS 18, November 1975. 49 p, 23 fig, 2 tab, 12 ref.

Descriptors: *Tides, *Storms, *Floods, *Gulf of Mexico, *Florida, Historic floods, Tidal waters, Model studies, Bays, Estuaries, Storm surge, Flood frequency, Frequency analysis, Frequency curves, Hurricanes, Coasts, Barrier islands, Winds, Wind tides, Analytical techniques.
Identifiers: *Storm tides, *Apalachicola Bay(Fla), *St. George Sound(Fla), Tide frequencies, Coastal flooding, Joint probability method.

Storm tide height frequency distributions were developed within Apalachicola Bay and St. George Sound, Florida, for the National Flood Insurance Program. This was accomplished by applying Overland's numerical bay model to a full set of climatologically representative hurricanes. Surge computations by the continental shelf SPLASH model were used as the boundary input from the Gulf of Mexico. Tide levels were shown in map form and as frequency distributions at selected points between annual frequencies of 0.10 and 0.002. The report illustrated the application of a joint probability method to assessing storm tides within a bay using a hydrodynamic model. (Sims-ISWS)

W77-03304

SALINITY INDUCED HORIZONTAL ESTUARINE CIRCULATION,
Texas A and M Univ., College Station, Dept. of Oceanography.
B.A. Elliott, and R.O. Reid.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW4, Proceedings Paper 12550, p 425-442, November 1976. 15 fig, 25 ref, 3 append. N000144-68-A-0308-0002.

Descriptors: *Salinity, *Estuaries, *Model studies, *Density, *Computer models, *Circulation, Physical properties, Density currents, Stratification, Estuarine environment, Gulfs, Oceanography, Chemical properties, Vortices, Mathematical models, Water circulation, Density stratification, Numerical analysis, Water properties.
Identifiers: *Estuarine circulation, *Salinity gradients, Finite differences, Horizontal salinity gradients, Density gradient.

A finite difference approximation to the equations of motion without the field acceleration terms and the salt conservation equation with an isotropic diffusion coefficient were used to model the circulation of a rectangular basin having the gross dimensional characteristics of a bar-built estuary. The recursion relations include the dynamic effects of horizontal salinity variations. Two cases were examined. In the first case, the basin has a constant depth; and in the second case, the bottom slope varies linearly across the basin. The resulting patterns of circulation were qualitatively analyzed using a vorticity equation. The analysis indicated that the dynamic effects of horizontal salinity gradients can be significant in controlling the circulation in localized sections of the basin. (Henley-ISWS)

W77-03312

SEASONAL VARIATION OF RESIDUAL DRIFT IN LONG ISLAND SOUND,
Connecticut Univ., Groton. Marine Sciences Inst.
D.F. Paskausky, and D.L. Murphy.
Estuarine and Coastal Marine Science, Vol. 4, No. 5, p 513-522, September 1976. 10 fig, 2 tab, 13 ref.

Field 2—WATER CYCLE

Group 2L—Estuaries

Descriptors: *Estuaries, *Sounds, *Drifting(Aquatic), *Onsite investigations, Winds, Currents(Water), On-site data collections, Circulation, Seasonal, Upwelling, Water circulation, Movement, Coasts, Connecticut.
Identifiers: *Long Island Sound.

Residual drift in Long Island Sound (LIS) was analyzed based on the recovery of 346 out of 951 surface and bottom drifters released at 86 locations in 1973 and 1974. Two periods of distinctly differing drift correlated with wind and freshwater discharge variation. The summer period (June to early November 1973) was characterized by relatively weak southwest winds and low freshwater discharge. In the winter period (after early November 1973), there were strong northwest winds and relatively high freshwater discharge. An estuarine circulation (surface outflow and bottom inflow) exists in eastern LIS throughout the year. Bottom drifter returns received in the summer period indicated that the westward flux of near bottom waters does not extend into central LIS past Mattituck Sill. During the winter season, near bottom waters move well into central LIS, and upwelling against the Connecticut coast is apparent. There was little evidence for significant near bottom exchange between western and central LIS. (Humphreys-ISWS)
W77-03322

SEDIMENT MASS BALANCE OF A LARGE ESTUARY, LONG ISLAND SOUND, Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.

H. J. Bokuniewicz, J. Gebert, and R. B. Gordon. Estuarine and Coastal Marine Science, Vol. 4, No. 5, p 523-536, September 1976. 8 fig, 1 tab, 29 ref, 1 plate.

Descriptors: *Estuaries, *Sounds, *Sediments, *Surveys, On-site investigations, Topography, Sounding, Measurement, Sediment distribution, Erosion, Geomorphology, Sands, Glacial drift.
Identifiers: *Long Island Sound.

Acoustic reflection profiles and bottom sampling were used to measure the volume of sediments accumulated in Long Island Sound. There is present 10 to the 10th power cu m of sediment of which 5.3 X 10 to the 9th power cu m is marine mud and 4.9 X 10 to the 8th power cu m is probably of pre-marine, lacustrine origin. The balance consists of reworked sand derived from glacial drift. The acoustically determined subbottom structure of the Sound and available sea level data indicate that the Sound basin was occupied by a large lake for at least 6,000 years and has been an arm of the sea since 8,000 years b.p. The volume of lacustrine sediment was accounted for by direct riverine input over 6,000 years, but the volume of marine mud present substantially exceeds the riverine supply over 8,000 years. The Sound was shown to act as a trap for sediments originating on the continental shelf. (Humphreys-ISWS)
W77-03323

RELATIONSHIPS BETWEEN SAND INPUT FROM RIVERS AND THE COMPOSITION OF SANDS FROM THE BEACHES OF SOUTHERN CALIFORNIA, University of Southern California, Los Angeles. Dept. of Geological Sciences.

R. M. Rice, D. S. Gorsline, and R. H. Osborne. Sedimentology, Vol. 23, No. 5, p 689-703, October 1976. 3 fig, 4 tab, 41 ref.

Descriptors: *Sands, *Beaches, *California, Rivers, Heavy metals, Coasts, Sediment transport, Streams, Sedimentation, Geology.
Identifiers: *Heavy mineral distribution, *Santa Clara River(Calif), Coastal zones, Principal component analysis, Discriminant function analysis.

During the period from 1967 through 1972, a sampling program was completed to determine the

economic potential of heavy metals in the beach and river sands of the southern California coastal zone. These samples were employed to test the hypothesis that sand composition in a given beach cell is dominantly controlled by the provenance draining into that cell and is not strongly influenced by longshore leakage from upcurrent cells. Sample sets obtained before and after the exceptional flood of 1969 made it possible to compare the sediment supplied by normal river flow with that supplied by a major flood. Multivariate statistical analysis of the heavy mineral distribution of southern California beaches and rivers indicated that the sand composition of the two northern cells is controlled by the dominantly sedimentary Transverse Range provenance, whereas the composition of the three southern cells is controlled by the dioritic Peninsular Ranges. Some leakage occurs between the two northern cells around the Point Dume-Hueneme-Mugu Canyon Zone, whereas no important southward mixing occurs between cells around the Palos Verdes-Redondo Canyon Zone. Even though the Santa Clara River flows mostly through sedimentary terrains, samples from this river strongly reflect the granodioritic source present in its headlands. Although the basic sand composition within each cell persists during major flooding, leakage between cells may increase following flooding, and the compositional packages present may show evidence of greater mixing. (Lee-ISWS)
W77-03324

A CINE-CAMERA TECHNIQUE FOR PROCESS MEASUREMENT ON A RIDGE AND RUNNEL BEACH, Reading Univ. (England). Dept. of Geology; and Reading Univ. (England). Sedimentology Research Lab.

P. Wright. Sedimentology, Vol. 23, No. 5, p 705-712, October 1976. 3 fig, 12 ref.

Descriptors: *Beaches, *Beach erosion, Coasts, Rocks, Hydrology, Sea water, Ripple marks, Geology, Waves(Water), Photography, *Measurement.
Identifiers: *Bed forms, Rock records, Swash-backwash action, Cine-camera technique, Sea ridge, Runnel beach, Photographic method.

Previous attempts to quantify beach processes with techniques involving direct measurement have met with varying degrees of success. Problems encountered can be attributed to three main areas of difficulty: (1) the rapidity of change in both process operation and the subsequent production and development of bed forms; (2) the inclement nature of the weather conditions during which the most rapid beach changes take place; and (3) interference by the equipment with the flows being measured. A photographic method was described here which, to a great extent, overcomes these problems and can be operated cheaply by a solitary field investigator. (Lee-ISWS)
W77-03325

LARGE SAND WAVES ON THE ATLANTIC OUTER CONTINENTAL SHELF AROUND WILMINGTON CANYON, OFF EASTERN UNITED STATES, Geological Survey, Boston, Mass.

H. J. Knebel, and D. W. Folger. Marine Geology, Vol. 22, No. 1, p M7-M15, September 1976. 3 fig, 25 ref.

Descriptors: *Sediment transport, *Sands, *Atlantic Ocean, *Continental Shelf, *Sand waves, Data collections, Ocean currents, Storms, Analytical techniques, Seismic studies.
Identifiers: *Wilmington Canyon, *Outer Continental Shelf.

New seismic-reflection data show that large sand waves near the head of Wilmington Canyon on the

Atlantic Outer Continental Shelf have a spacing of 100-650 m and a relief of 2-9 m. The bedforms trend northwest and are asymmetrical, the steeper slopes being toward the south or west. Vibracore sediments indicate that the waves apparently have formed on a substrate of relict nearshore sediments. Although the age of the original bedforms is unknown, the asymmetry is consistent with the dominant westerly to southerly drift in this area which has been determined by other methods; the asymmetry, therefore, is probably modern. Observations in the sand-wave area during August 1975, revealed weak bottom currents, sediment bioturbation, unrippled microtopography, and lack of scour. Thus, the asymmetry may be maintained by periodic water motion, possibly associated with storms or perhaps with flow in the canyon head. (Woodard-USGS)
W77-03332

WINTER CONDITIONS IN THE NEW YORK BIGHT, 1973-1974, Grumman Ecosystems Corp., Bethpage, N. Y.; and Lawler, Matusky and Skelly Engineers, Tappan, N. Y.

For primary bibliographic entry see Field 5C.
W77-03380

ASSAETAGUE ECOLOGICAL STUDIES, Maryland Univ., Solomons. Natural Resources Inst.

For primary bibliographic entry see Field 5C.
W77-03381

SEASONAL INTERACTIONS AMONG ESTUARINE PRIMARY PRODUCERS AND HERBIVORES, Maryland Univ., Solomons, Md. Chesapeake Biological Lab.

D. R. Heinle, S. Richman, S. D. Van Valkenburg, and J. D. Allan. Available from the National Technical Information Service, Springfield, VA 22161 as ORO 48481. Price codes: A03 in paper copy, A01 in microfiche. Progress Report, July 1975. 41 p, 18 fig, 16 ref. AT-(40-1)-4848.

Descriptors: *Estuaries, *Copepods, *Food habits, *Biomass, Biorhythms, Particle size, *Chesapeake Bay, Zooplankton, Digestion, Crustaceans, Plankton, Seasonal, Instrumentation, Herbivores, Primary productivity, Maryland. Identifiers: Eurytemora affinis, Acartia tonsa, Acartia clausi, Automated particle counting systems, *Patuxent River(Md).

Studies with an automated particle counting system of the feeding activities of Chesapeake Bay and Patuxent River copepods show that, while adult Eurytemora affinis can ingest particles ranging in size from 3 to 24 millimicrons spherical equivalent diameter, their filtering rate is highest when ingesting particle sizes which correspond to the mode of the particle biomass distribution. Accordingly, the copepods vary their maximum filtering rate in accordance with changes in time of the biomass peaks. The copepods Acartia tonsa and Acartia clausi have similar feeding habits; but in contrast to Eurytemora affinis, they prefer relatively large particles of 20 millimicrons regardless of biomass distribution. Concomitant testing and comparisons with earlier research, primarily on Eurytemora affinis, indicate that juvenile copepods in the nauplius stages feed rather unselectively over a broad range of particle sizes, with a tendency toward higher filtering rates for larger particles when such particles are fairly common. Moreover, maximum feeding efficiency at or near concentration peaks appears to establish itself in the early copepodite state and possibly even in a late nauplius stage. Laboratory pilot experiments also show that the filtering rate of Eurytemora affinis shows a threshold response with prey selection switching from the small to the large particles. (Harris-Wisconsin)
W77-03387

BREAKUP FLOODING AND NUTRIENT SOURCE OF COLVILLE RIVER DELTA DURING 1973.
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5B.
W77-03388

THE COST OF COASTAL ZONING.
For primary bibliographic entry see Field 6E.
W77-03535

FEASIBILITY OF TRANSPLANTATION, REVEGETATION, AND RESTORATION OF EELGRASS IN SAN DIEGO BAY, CALIFORNIA.
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5G.
W77-03546

GROUND WATER BASIN PROTECTION PROJECTS: FREMONT SALINITY BARRIER.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 4B.
W77-03555

A MODEL FOR THE CONTROL OF DISSOLVED MANGANESE IN THE INTERSTITIAL WATERS OF CHESAPEAKE BAY.
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 5B.
W77-03556

REHABILITATION OF PAMLICO SOUND OYSTER PRODUCING GROUNDS DAMAGED OR DESTROYED BY HURRICANE GINGER.
North Carolina Div. of Marine Fisheries, Raleigh.
For primary bibliographic entry see Field 6B.
W77-03562

HURDLES IN THE PATH OF COASTAL PLAN IMPLEMENTATION.
For primary bibliographic entry see Field 6B.
W77-03582

A CLOSER LOOK AT SOME ISSUES FOR GENERA-OCEANS POLICY, MARINE ENVIRONMENT, AND FISHERIES.
Columbia Univ., New York. School of Law.
For primary bibliographic entry see Field 6E.
W77-03585

ENVIRONMENTAL CONCERN AS A FACTOR IN COASTAL ZONE DEVELOPMENT: A STUDY OF LOUISIANA CITIZENS.
Louisiana State Univ., Baton Rouge. Dept. of Rural Sociology Research.
For primary bibliographic entry see Field 6G.
W77-03590

COMING SHOWDOWN: OCEAN NATIONALISM AND THE SENATE 200-MILE SHELF BILL.
Villanova Univ., Pa. Inst. of World Order Research.
For primary bibliographic entry see Field 6E.
W77-03591

NORTHWEST MARICULTURE LAWS.
Oregon State Univ., Corvallis. Sea Grant Coll. Program; and Oregon State Univ., Ocean Resources Law Program.
For primary bibliographic entry see Field 6E.
W77-03598

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ONE PASS SEAWATER DESALTING RO PILOT PLANT EVALUATION.
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
P. P. Goodwyn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 207. Price codes: A06 in paper copy, A01 in microfiche. OWRT/S-77/1, Final Report, June 1976. 95 p, 15 tab, 7 fig, 13 ref. OWRT 14-34-0001-6507.

Descriptors: Desalination, *Desalination processes, *Membrane processes, *Reverse osmosis, Sea water, *Pilot plants, Estimated costs, Pre-treatment(Water).
Identifiers: Polyamide hollow fiber permeators, Dechlorination, Fouling control, Cost estimates, Wrightsville Beach(NC).

Results obtained with three different modes of biological fouling control for reverse osmosis seawater systems, as tested at the OWRT Wrightsville Beach Test Facility (WBTF), are discussed. Modes tested were (1) chlorination followed by carbon dechlorination; (2) chemical dechlorination with sodium bisulfite instead of carbon; (3) ultraviolet (UV) irradiation instead of chlorination/dechlorination. Polyamide hollow fiber reverse osmosis permeators operating at 800 psi and desalting seawater in a single stage were used in these tests. Collectively, the RO test systems produced about 15,000 gpd of potable water. Either UV or chlorine treatment with bisulfite dechlorination was as effective as chlorination with carbon treatment in maintaining stable performance in this test. Earlier cost analyses were revised to reflect more realistic bases. Carbon treatment was substantially more expensive than either of the other options. Demonstrated service life for 4-inch and 8-inch diameter polyamide hollow fiber RO permeators was extended to more than 6000 and 4000 hours, respectively. Operating experience, recommended pretreatment procedure and suggested further studies are discussed. (OWRT)
W77-03076

STUDIES ON A MECHANISM FOR SALT REJECTION IN REVERSE OSMOSIS MEMBRANES AS A GUIDE TO IMPROVED MATERIALS FOR DESALINATION OF SEA WATER.
Pittsburgh Univ., Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 410. Price codes: A05 in paper copy, A01 in microfiche. OWRT/S-77/2, Final Report, 1976, 74 p. OWRT 14-30-3241.

Descriptors: *Desalination processes, Sea water, *Reverse osmosis, *Membranes, *Membrane processes, Materials, *Ion transport, *Anion exchange, Aqueous solution, Chemical analysis, *Spectroscopy, Ion exchange, Hydration.
Identifiers: *Cellulose acetate membranes, Non-aqueous media, Electron spectroscopy, Flame emission spectroscopy, Phosphorylated cellulose acetate membranes.

This report is presented in two parts which describe studies of the interactions of ions with water in nonaqueous systems in general and in reverse osmosis membranes in particular. The first part describes studies of cellulose acetate membranes which have been treated with aqueous salt solutions. The membranes were studied by ESCA (Electron Spectroscopy for Chemical Analysis) and by Flame Emission Spectroscopy. It is shown

that sodium ions penetrate and are retained in the membranes, even after rinsing and that their interaction appears to be particularly strong in the active side of the asymmetrical membranes. An attempt was also made to prepare an effective phosphorylated cellulose acetate membrane which should show superior resistance to hydrolysis at high pH. This phase of the project was not completed, but a recent Japanese patent shows that such membranes may be operable. Further development of such membranes is recommended. The second part of the report describes studies of the hydration of anions in non-polar non-hydrolysis solvents. The resulting free energies of hydration are related to a large number of other water-ion interactions. It is suggested that ion separation by membranes can be profitably regarded in terms of the energy required for dehydration rather than as the consequence of some kind of ion-rejection by the membrane.
W77-03290

3B. Water Yield Improvement

PLASTIC-REINFORCED ASPHALT SEEPAGE BARRIER.
Arizona Water Resources Research Center, Tucson.
R. K. Frobel, and C. B. Cluff.
Paper Reprint, Journal of the Irrigation and Drainage Division, ASCE, Vol. 102, No. IR3, Proc. Paper 12430, September, 1976, p. 369-380, 8 fig, 1 tab, 8 ref. OWRT A-059-ARIZ(3). 14-31-0001-5003.

Descriptors: Adhesion, *Asphalts, Linings, Membranes, *Plastics, *Reinforcement, *Seepage, Water resources, *Barriers, Equipment, Testing.
Identifiers: *Puncture resistance.

This report is concerned with laboratory equipment development, laboratory testing, and field investigations of a water seepage barrier consisting of plastic-reinforced asphalt. Three testing methods were utilized and evaluated in the asphalt-plastic-asphalt-chip-coated (APAC) membrane investigation. The first test method evaluated the hydrostatic puncture resistance of an asphalt-polyethylene combination. This test confirmed the hypothesis that the asphalt effectively increases the puncture resistance of the APAC membrane over that of plain polyethylene. The second test investigated the slope stability of a protective APAC chip seal. It was found that a typical 3/8-in. (9.5-mm) cover aggregate remained stable on constructed slopes of 3:1 and 4:1 and also remained stable on a 2:1 slope up to a surface temperature of 122°F (50°C). The third test method evaluated adhesive materials and determined the best suited adhesive for sealing polyethylene overlaps. Subsequent field investigations resulted in equipment development that increased construction efficiency in the installation of the APAC membrane.
W77-03120

A COMPARISON OF SEASONAL PRIMARY PRODUCTION OF MOJAVE DESERT SHRUBS DURING WET AND DRY YEARS.
EG and G Environmental Consultants, Denver, Colo.
For primary bibliographic entry see Field 21.
W77-03138

AFFORESTATION IN LOW RAINFALL AREAS.
Department of Forestry, Pretoria (South Africa).
For primary bibliographic entry see Field 4D.
W77-03139

COMPARATIVE PHOTOSYNTHETIC PRODUCTION OF MOJAVE DESERT SHRUBS.
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 2D.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3B—Water Yield Improvement

W77-03141

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, EXECUTIVE SUMMARY.

M and B Associates, San Ramon, Calif.
C. C. Lovell, A. K. Goroch, and K. W. Chu.
Report MB-R-76/75A, July 1975. 38 p, 2 fig, 116 ref. Prepared for Bureau of Reclamation, Denver, Colorado, Engineering Research Center. BuRec 14-06-D-7659.

Descriptors: *Storms, Snowfall, Snowpacks, Climatology, Precipitation(Atmospheric), *Cloud seeding, Hydrology, *Weather modification, Experimental design, *Cloud physics, Streamflow. Identifiers: *Sierra Nevada region, *Winter storms, *Mesoscale, Climatology.

Results are presented of a design study for a pilot program to augment snowpack in the Sierra Nevada. The background for the program includes a review of the synoptic and mesoscale climatology and the cloud physics of winter storms in the area. The climatology and cloud physics relationships to precipitation occurrence, rate, and duration within the river basins under consideration are established. A hydrology model was used to estimate the run-off enhancement potential as a function of the type of precipitation and target areas. The result of these simulations is followed by a review of the state of cloud model development and of possible uses of models in a pilot program. Finally, the seeding potential of Sierra Nevada storms is explored. This background information is synthesized to form a physical model of precipitation mechanisms in the Sierra Nevada. The model establishes a set of hypotheses which, in turn, form the basis of the experimental design for the pilot program. The operational requirements are presented in another volume. (See W77-03213 thru W77-03215) (Bur Reclam)

W77-03212

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, VOLUME I - METEOROLOGY AND HYDROLOGY OF THE NORTHERN SIERRA NEVADA, FINAL REPORT.

M and B Associates, San Ramon, Calif.
Report MB-R-76/75A, July 1976. 161 p, 25 fig, 3 tab, 116 ref, 2 append. Prepared for Bureau of Reclamation, Denver, Colorado, Engineering and Research Center. BuRec 14-06-D-7659.

Descriptors: *Weather modification, *Meteorology, Hydrology, Reviews, *Cloud physics, *Model studies, *Climatology, Nucleation, Synoptic analysis, *Storms, Snowfall, River basins, Streamflow, Runoff, Simulation analysis, Precipitation(Atmospheric), Data collections, Data processing. Identifiers: *Sierra Nevada region, Meso-scale climatology, Winter storms.

This first volume presents a review of the setting for the program, including the meteorology and hydrology of the Central and Northern Sierra Nevada, a review of the state of knowledge of the cloud physics, and associated models with possible applicability to the region. The first part of this volume is intended to provide a complete background for the design. It begins with a review of the synoptic and meso-scale climatology of the Sierra Nevada, followed by a similar review of the state of knowledge of the cloud physics of winter storms in this region. The result of a statistical study of snowfall relationships within the river basins under consideration is presented. Precipitation rates and duration as a function of elevation are related to the climatology and cloud physics peculiar to Sierra Nevada winter storms. The results of the hydrology portion of the study are presented with an emphasis on the run-off

enhancement potential as a function of the type of precipitation and target area. Then a review of the possible uses of simulation models in a pilot program and the state of model development available for these applications is discussed. (See also W77-03212) (Bureau of Reclamation)

W77-03213

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, VOLUME II - PHYSICAL AND STATISTICAL DESIGN, FINAL REPORT.

M and B Associates, San Ramon, Calif.
Report MB-R-76/75A, July 1976. 73 p, 1 fig, 6 tab, 116 ref. Prepared for: Bureau of Reclamation, Denver, Colorado, Engineering and Research Center. BuRec 14-06-D-7659.

Descriptors: *Weather modification, *Meteorology, Hydrology, Reviews, *Cloud physics, *Model studies, *Climatology, Nucleation, Synoptic analysis, *Storms, Snowfall, River basins, Streamflow, Runoff, Simulation analysis, Precipitation(Atmospheric), Data collections, Data processing. Identifiers: *Sierra Nevada region, Meso-scale climatology, Winter storms.

This second volume presents a physical model for snow augmentation based on the background and analysis presented in Volume I. (See W77-03213) This model of seedable alternatives for the Sierra Nevada provides the basis for a series of physical hypotheses for snowfall enhancement. These hypotheses are structured in such a way as to provide the basis for an experimental design for the assessment of the augmentation potential in Sierra Nevada winter storms. The statistical design for the experiment has been developed and is also presented in this volume. The design is structured against the hypotheses developed in the first sections of this volume and is based on the statistics of the precipitation in the Sierra Nevada presented in Volume I. (See also W77-03212.) (Bureau of Reclamation)

W77-03214

WEATHER MODIFICATION DESIGN STUDY FOR STREAMFLOW AUGMENTATION IN THE NORTHERN SIERRA NEVADA, VOLUME III - OPERATIONAL DESIGN, FINAL REPORT.

M and B Associates, San Ramon, Calif.
Report MB-R-76/75A, July 1976. 83 p, 12 fig, 5 tab, 116 ref. Prepared for: Bureau of Reclamation, Denver, Colorado, Engineering and Research Center. BuRec 14-06-D-7659.

Descriptors: *Weather modification, *Cloud seeding, Storms, *Snowpacks, *Design criteria, Design data, Design storm, *Optimization, Streamflow, Forecasting, Meteorology, Precipitation(Atmospheric), Costs, Operations. Identifiers: *Snow augmentation, *American River drainage basin, *Sierra Nevada region.

This third volume discusses the specific recommendations for the operational design of the snow augmentation project in the Sierra Nevada. Volumes I and II (See W77-03213 and W77-03214) contain the background information and scientific analyses which provided the rationale for making the specific recommendations contained in this volume. Recommended forecasting procedures, daily operating procedures, and evaluation procedures are contained in the first three sections. The fourth section discusses various hardware systems. Several programs in the Sierra Nevada have shown that weather modification is technically feasible. The primary goals of the project are further development of the technology of when and how to optimally seed the storms and to evaluate the effectiveness of cloud seeding for the augmentation of snowpack. The optimum snow augmentation technique for conditions peculiar to the Sierra Nevada was identified and a plan for

implementing the technique was developed. A statistical design was formulated which would most efficiently measure the effectiveness of the snow augmentation technique. Major aspects of the recommended design are: a randomized experiment involving the entire target area; utilization of both forecasts and real time data for the declaration of experimental days; a basic experimental unit of a 24-hour period; and seeding conducted by both ground-based generators and airborne generators. (See also W77-03212) (Bureau of Reclamation)

W77-03215

ELECTROSTATIC INDUCTION PARAMETERS TO ATTAIN MAXIMUM SPRAY CHARGE TO CLEAR FOG.

Naval Weapons Center, China Lake, Calif. Research Dept.
J. W. Carroz, and P. N. Keller.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A019 483. Price codes: A03 in paper copy, A01 in microfiche. Report NWC TP 5796, January 1976. 30 p, 11 fig, 1 tab, 29 ref.

Descriptors: *Weather modification, *Fog, *Sprays, Spraying, Laboratory tests, Equipment, Nozzles, Droplets, Drops(Fluid), Conductivity, Electrical conductance, Electrical coronas, Electrical studies. Identifiers: *Fog clearing, *Spray charge, Electrostatic induction.

Laboratory experiments using sprays of charged drops were conducted to support a fog clearing program. Sprays from 1-g/s hollow-cone industrial spray nozzles were induction-charged to one-quarter of the Rayleigh charged drop stability limit. As the nozzle size was increased, a smaller fraction of the Rayleigh stability limit was achieved. Increasing the airflow past the nozzle increased the charge on the spray. Increasing induction surface, fluid conductivity, and voltage increased the spray charge to a limit beyond which further increases decreased the spray charge. Increasing the fluid pressure increased the total spray current but not the charge-to-mass ratio. The laboratory data agree with a qualitative derivation relating drop charge to the nozzle spray geometry. The derivation shows that the greatest charge-to-mass ratio will be achieved with narrow-cone-angle nozzles. (Sims-ISWS)

W77-03299

ARTIFICIAL MODIFICATION OF ATMOSPHERIC PROCESSES.

Ye. Ye. Korniyenko, L. A. Mirmovich, and K. Ya. Orlov.
Report JPRS 66267, December 2, 1975. 19 p, 7 fig, 4 tab, 22 ref. Translation of Fizika Oblakov i Aktivnykh Vozdeystviy, Trudy Ukrainskogo Nauchno - Issledovatel' Skogo Gidrometeorologicheskogo Instituta, No. 125, 1973.

Descriptors: *Weather modification, *Cloud physics, *Precipitation(Atmospheric), Clouds, Cloud seeding, Aircraft, Instrumentation, Data processing, Regression analysis, On-site investigations, Artificial precipitation, Statistics, Analytical techniques, Meteorology. Identifiers: *USSR.

The report contained data on the problem of planning experiments on the modification of cumulonimbus clouds for artificial precipitation regulation. The report also described peculiarities of 'flying laboratories' which are used to investigate artificial modification of atmospheric processes. (Sims-ISWS)

W77-03303

THE REGULATION OF TRANSPIRATION EXPENDITURE OF MOISTURE BY PLANTS WITH

THE AID OF ANTITRANSPIRANTS, (IN RUSSIAN), Moskovskii Lesotekhnicheskii Institut (USSR). V. P. Dadykin, and A. D. Potapova. Izv Akad Nauk Sssr Ser Biol 2, p 262-274, 1975.

Descriptors: *Transpiration, *Transpiration control, *Antitranspirants, Soil moisture, Thin films, Polymers, Moisture stress, Drought resistance, Soil-water-plant relationships.

Various polymer materials were used as antitranspirants, forming on the leaves thin, transparent, elastic films, as well as a number of chemical compounds causing the closing of guard cells. Antitranspirants of the membranous type are more promising. The application of antitranspirants is most effective under conditions of sufficient soil moisture. Antitranspirants help the plants to endure humidity stresses: temporary drought, dry winds, transplantation, etc. W77-03475

3C. Use Of Water Of Impaired Quality

FACTORS OF SOIL SALINIZATION DURING IRRIGATION IN THE TURAN LOWLAND, (IN RUSSIAN), For primary bibliographic entry see Field 2G. W77-03124

REACTIONS OF HEAVY METALS WITH SOILS WITH SPECIAL REGARD TO THEIR APPLICATION IN SEWAGE WASTES, Melbourne Univ., Parkville (Australia). Dept. of Agricultural Chemistry. For primary bibliographic entry see Field 5B. W77-03359

EFFECT OF ADDED SALTS ON NITROGEN RELEASED AND NITRATE LEVELS IN FOREST SOILS OF THE WASHINGTON COASTAL AREA, Western Washington Research and Extension Center, Puyallup. For primary bibliographic entry see Field 2G. W77-03396

WATER MANAGEMENT AND REGULATION OF WATER USE, Central and Southern Florida Flood Control District, West Palm Beach. For primary bibliographic entry see Field 6B. W77-03525

3D. Conservation In Domestic and Municipal Use

LOCAL WATER SYSTEMS ARE FREQUENTLY NEGLECTED, Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics. For primary bibliographic entry see Field 6B. W77-03121

USER ORIENTED SYSTEMS ANALYSIS FOR REGIONAL MUNICIPAL WATER SUPPLY PLANNING, Utah State Univ., Logan. Coll. of Engineering. For primary bibliographic entry see Field 6A. W77-03159

WATER RESOURCES OF AUSTRALIA AND THE PATTERN OF POPULATION CONCENTRATIONS, For primary bibliographic entry see Field 6D. W77-03278

LAND BASED SEWAGE SLUDGE MANAGEMENT ALTERNATIVES FOR LOS ANGELES: EVALUATION AND COMPARISON, California Univ., Los Angeles. School of Architecture and Urban Planning. For primary bibliographic entry see Field 5D. W77-03289

SPECIFIC ROLE OF LIME IN MUNICIPAL WASTE WATER TREATMENT-EXPECTATIONS AND REALITY (DIE SPEZIFISCHE ROLLE DES KALKS IN DER KOMMUNALEN ABWASSERREINIGUNG-ERWARTUNGEN UND REALITAETEN), For primary bibliographic entry see Field 5D. W77-03422

URBAN WATER USE IN CALIFORNIA, California State Dept. of Water Resources, Sacramento. For primary bibliographic entry see Field 6B. W77-03549

3E. Conservation In Industry

UTILIZATION OF MUNICIPAL WASTE WATER FOR FROTH FLOTATION OF COPPER AND MOLYBDENUM SULFIDES, Arizona Bureau of Mines, Tucson. For primary bibliographic entry see Field 5D. W77-03132

ELECTRIC POWER DEVELOPMENT IN THE PACIFIC NORTHWEST REGION: INSTITUTIONAL COMMITMENTS AND ALTERNATIVES, PHASE I, Washington Univ., Seattle. Inst. for Environmental Studies. For primary bibliographic entry see Field 6E. W77-03288

PLAN OF STUDY OF THE HYDROLOGY OF THE MADISON LIMESTONE AND ASSOCIATED ROCKS IN PARTS OF MONTANA, NEBRASKA, NORTH DAKOTA, SOUTH DAKOTA, AND WYOMING, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 4B. W77-03338

HYDROLOGIC STUDIES BY THE U.S. GEOLOGICAL SURVEY IN OIL-SHALE AREAS OF COLORADO, UTAH, AND WYOMING, 1976, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 4B. W77-03340

INVESTIGATION OF THE PHYSICAL FEASIBILITY OF MOBILE FISH PROCESSING PLANTS, Fisheries and Marine Service, Ottawa (Ontario). Research and Development Directorate. For primary bibliographic entry see Field 6B. W77-03558

FERMENTATION OF WASTE MATERIALS TO PRODUCE INDUSTRIAL INTERMEDIATES, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5D. W77-03563

KEEP COOL WITH SEWAGE EFFLUENT - A TWO-WAY SAVING OF WATER, R. Wood. Process Engineering, p 71, June, 1976. 1 fig.

Descriptors: *Water reuse, *Sewage effluents, *Nitrification, *Cost analysis, *Cooling water, *Power plants, Recycling, Cleaning, Activated sludge.

A procedure using sewage effluent as cooling water in power plants was discussed. Croydon Power Station, built on top of a sewage works in Britain, was the example used. Treated effluent with borehole water for makeup has been successful. No metallic corrosion problems appeared and there was no need for manual cleaning of condensers or acid washing. The natural draught cooling towers acted as nitrifiers and the pond acted as an activated sludge system; thus, effluent quality was improved. The towers also maintained necessary nitrification during the winter. It was concluded that sewage effluent may be used in other applications to provide water savings. (Collins-FIRL.) W77-03578

3F. Conservation In Agriculture

ELECTRONIC SENSOR FOR LOW-TO-MEDIUM WINDSPEEDS, Agricultural Research Service, Yakima, Wash. For primary bibliographic entry see Field 7B. W77-03099

TIME OF PLANTING EFFECTS ON DEVELOPMENT, YIELD, AND OIL QUALITY OF IRRIGATED SUNFLOWER, Queensland Dept. of Primary Industries, Emerald (Australia). G. D. Keefer, J. E. McAllister, E. S. Uridge, and B. W. Simpson. Australian Journal of Experimental Agriculture and Animal Husbandry, Vol. 16, p 417-422, 1976. 3 fig, 11 ref.

Descriptors: *Crop response, *Oilseed crops, *Crop production, *Planting management, *Seeds, Irrigation, Climatic data, Soil types, Agronomic crops, Fertilizers, Crops, Time, Growth stages, Environmental effects, Plant diseases, Rusts, Surface irrigation, Australia, Irrigation programs. Identifiers: *Sunflower.

In the summers of 1969-1970 and 1970-1971, investigations were undertaken to determine whether sunflower should be considered a possible crop for an irrigation project in northern Australia. Experiments were conducted on irrigated sunflower to determine the effect of time of planting on crop development, seed yield, and oil quality. In both seasons significantly higher seed and oil yields were obtained from a December planting. Lower yields at all times of planting in the second season were attributed to rust infection. A good correlation was obtained between oil quality and temperatures during the post flowering period. Oil quality improved with late sowing in association with lowered temperatures. Results of the two trials indicate that mid to late December or possibly January are the best planting months for irrigated sunflower. Rust-resistant cultivars or rust control methods would be necessary to ensure high yields in all seasons, particularly from late planted crops. (Jamail-Arizona) W77-03135

EFFECT OF WATER STRESS ON THE PHASIC DEVELOPMENT OF ANNUAL MEDICAGO SPECIES, Queensland Dept. of Primary Industries, Warwick (Australia). For primary bibliographic entry see Field 21. W77-03136

SOIL MOISTURE DISTRIBUTION UNDER WIDE-BED, NARROW-ROW, AND CONVENTIONAL-ROW COTTON, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

H. Gessesse.

Master of Science Thesis, 1976. 51 p, 8 fig, 4 tab, 31 ref, append.

Descriptors: *Irrigation efficiency, *Irrigation practices, *Irrigation effects, *Furrow irrigation, *Moisture content, Soil moisture, Furrows, Crop production, Irrigation, Irrigation systems, Soil-water-plant relationships, Surface irrigation, Water conservation, Cultivation, *Cotton, Moisture tension, Moisture up:ake.

The effect of furrow spacing on the moisture distribution pattern under cotton was investigated. Vertical and lateral soil moisture distributions were studied under two methods of row spacings. Results indicated that conventional rows had more soil moisture during the entire season, compared to wide-bed, narrow-rows. However, conventional rows received higher quantities of water at each irrigation. A large percentage of the soil moisture was depleted from the top 90 centimeters of soil under both row spacings. When average lint yields per hectare were compared, conventional row spacing with preirrigation gave best results. Conventional irrigated up, wide-bed preirrigated, and wide-bed irrigated up gave similar results. When the average seed cotton yields per hectare were compared, conventional row preirrigated, conventional row irrigated up, wide-bed, narrow-row preirrigated, and wide-bed, narrow-row irrigated up gave similar results. (Jamail-Arizona) W77-03137

EFFECT OF DROUGHT STRESS FREQUENCIES AT DIFFERENT GROWTH STAGES ON CORN YIELD,

Alexandria Univ. (Egypt). Dept. of Soil and Water Science; and Tanta Univ. (Egypt). Dept. of Soil and Water Science.

H. M. A. Bakr, S. A. Gaheen, and M. A. Mohammed.

Alexandria Journal of Agricultural Research, Vol. 23, No. 3, p 643-651, December, 1975. 10 tab, 18 ref.

Descriptors: *Corn(Field), *Irrigation practices, *Moisture stress, *Crop response, *Irrigation effects, Frequency, Droughts, Stress, Crop production, Irrigation, Irrigation water, Soil moisture, Moisture content, Field capacity, Growth stages, Semiarid climates, Root zone, Soil types, Water conservation.

A study of irrigation frequencies was carried out at the Sakha Agricultural Experimental Station in two successive growing seasons. The objective was to compare normal quantities of irrigation water used by Egyptian farmers with those calculated for the soil moisture content at the field capacity plus 10 percent to be added at different growth stages of corn. The experiment was designed according to completely random blocks of six treatments, each of eight replicates. Results show that the treatment where eight calculated waterings were applied without any drought stress during the growing season had the highest corn yield. Assuming similar field conditions, corn production in Egypt could be increased by two hundred and ten million kilograms. In addition, a great amount of irrigation water could be saved. The importance of the first irrigation is also pointed out. It's prevention significantly reduces the number of plants. (Jamail-Arizona) W77-03143

EVAPOTRANSPIRATION REDUCTION BY FIELD GEOMETRY EFFECTS,

Oklahoma State Univ., Stillwater. Dept. of Agronomy.

For primary bibliographic entry see Field 2D. W77-03169

DETERMINING THE MOST PROFITABLE NITROGEN FERTILIZATION FOR CORN PRODUCTION,

Tennessee Univ., Knoxville. Agricultural Experiment Station.

W. L. Parks, and J. Overton. Tennessee Farm and Home Science Progress Report 98, April-June 1976, p 26-28. 1 fig, 3 tab. OWRT A-017-TENN(5). 14-31-001-3843.

Descriptors: *Fertilization, *Nitrogen, *Corn(Field), *Crop production, Rainfall, Soil moisture, Tennessee.

In determining the most profitable rate for nitrogen fertilization for corn, it is essential that nitrogen fertilization rate experiments be conducted at different locations in the state through several years. It is also essential that the rainfall distribution pattern and soil moisture utilization patterns during these experiments be adequately measured and complete records obtained. Once these yield data, rainfall, and moisture information have been obtained in a number of places across the state, it is possible to combine these data with the weather history that has been accumulated over much longer periods of time and arrive at the probable best nitrogen fertilization rate for use in a given area on corn. This research developed response relationships from a 3-year corn-nitrogen experiment at the West Tennessee Experiment Station at Jackson, Tennessee and expressed corn yields as a function of nitrogen (N) rate and drought intensity. (Larson-Tennessee) W77-03172

A COMPUTER PROGRAM FOR ESTIMATING COSTS OF OWNING AND OPERATING AN IRRIGATION WELL UNDER CONDITIONS OF DECLINING WATER LEVELS,

Washington State Univ., Pullman. Dept. of Agricultural Economics.

For primary bibliographic entry see Field 6C. W77-03211

EFFECTS OF SOIL-MOISTURE REGIMES ON THE GROWTH OF BARLEY,

Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.

A. D. Day, and R. K. Thompson. Agronomy Journal, Vol 67, No 3, p 430-432, May-June 1975. 4 tab, 9 ref.

Descriptors: *Moisture stress, *Soil water, *Barley, *Crop response, Irrigation, Irrigation effects.

Effects of soil-moisture stress at three different stages of growth (jointing, flowering, and dough) on grain yield, grain quality, and plant growth of Spring barley planted in November were studied under the field conditions at Mesa, Arizona. The experiment was conducted to determine the limitations to irrigation water conservation in a semi arid environment. Four by four Latin square designs were used to compare four irrigation treatments. Effects of soil-moisture stress for 7 days at the jointing, flowering, and dough stages of growth and/or until 100% of available water in the first 3 feet of soil was depleted were compared with plants not stressed. Withholding irrigation water during the jointing stage of growth did not reduce and in some cases increased grain yields. Moisture stress at the flowering and dough stages of growth decreased grain yield. Moisture stress at the dough lowered grain bushel-weight. Stressing barley for water at jointing resulted in shorter plants, less lodging, more tillering, and more heads per unit area. Moisture stress at flowering and the dough stage decreased seeds per head and seed weight, respectively. Cultivars differed in response to soil-moisture stress. Adequate soil-moisture must be provided throughout the growing season for maximum yields of high quality grain from Spring barley grown as a Winter-annual under irrigation. (Skogerboe-Colo St) W77-03216

DIURNAL FLUCTUATION OF LEAF-WATER POTENTIAL OF CORN AS INFLUENCED BY SOIL MATRIC POTENTIAL AND MICROCLIMATE,

Agricultural Research Service, Florence, S. C. Coastal Plains Soil and Water Conservation Research Center.

D. C. Reicosky, R. B. Campbell, and C. W. Doty. Agronomy Journal Vol. 67, No. 3, p 380-385, May-June 1975. 4 fig, 1 tab, 21 ref.

Descriptors: *Microclimatology, *Moisture stress, *Moisture tension, *Crop response, *Corn(Field), Irrigation, Irrigation effects, Crop production. Identifiers: *Leaf water potential, *Soil matric potential.

Water stress during critical growth periods is frequently the limiting factor in crop production. However few data are available on the variation of plant water status under field conditions. The object of this work was to quantify the effect of soil matric potential on plant water status. Sweet corn was grown on a Varina sandy loam soil to determine the effect of the microclimate and irrigation on leaf water potential. Soil water stress was imposed naturally and by use of automated portable shelters that covered the plots during rainfall. Leaf-water potential was closely related to the diurnal change of incoming energy. A maximum leaf-water potential of -1.5 bars occurred just prior to sunrise. The minimum value, which occurred during the peak radiation load or stress, was dependent on soil matric potential and stage of plant development. (Skogerboe-Colo St) W77-03394

VEGETATIVE WATER USE IN CALIFORNIA, 1974.

California State Dept. of Water Resources, Sacramento. Water Use Programs.

Bulletin No. 113-3, April 1975. 115 p, 3 fig, 35 tab, 2 plates, 24 ref, 10 append.

Descriptors: *Evapotranspiration, *Evaporation, *California, *Irrigation, *Water demand, Hydrologic cycle, Irrigation effects, Evapotranspiration control, Water conservation, Water yield improvement, Transpiration, Vegetable crops, Irrigation water, Irrigation efficiency, Water requirements, Crop production, Water distribution(Applied), Water allocation(Policy).

One year's summary data by month, are provided for agricultural water use in California—which accounts for 85% of the state's total water use. Information is given for the three components of agricultural water use (crop-growing season evapotranspiration, applied water evapotranspiration, and applied water requirements) in estimations subdivided for the principal irrigated crops in various zones of particular agricultural importance to the state. Evaporative demand data includes agroclimatic field studies, evaporative demand zones, and coastal evaporative gradients. Evapotranspiration data is given for measured evapotranspiration, correlating measured evapotranspiration to evaporation, transfer of data, correction evaluations, estimating crop growing season evapotranspiration and estimating evapotranspiration of applied water. Data on average applied water requirements is supplied for nine zones of agricultural importance, including information on high and low values found within each area. Other data supplied with the study includes a summary of observed evaporation from Class 'A' pans located in irrigated pasture environments, observed monthly net atometer evaporation, observed incoming solar radiation, and information concerning grass evapotranspiration. (Harris-Wisconsin) W77-03554

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

CORRELATION ANALYSIS OF HYDROMETEOROLOGICAL DATA, Central and Southern Florida Flood Control District, West Palm Beach. Environmental Engineering. For primary bibliographic entry see Field 2A. W77-03086

UNDRAINED BEHAVIOR OF EMBANKMENTS ON NEW LISKEARD VARVED CLAY, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Constructed Facilities Div. For primary bibliographic entry see Field 8D. W77-03108

STATE AND COUNTY AREA TABULATIONS FOR THE COLORADO RIVER BASIN, Public Health Service, Denver, Colo. Div. of Water Supply and Pollution Control. For primary bibliographic entry see Field 7C. W77-03110

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA, Department of the Environment, Ottawa (Ontario). Applied Hydrology Div. For primary bibliographic entry see Field 7B. W77-03111

GUIDELINES FOR FLASH FLOOD AND SMALL TRIBUTARY FLOOD PREDICTION, National Weather Service, Kansas City, Mo. Central Region. L. A. Hughes, and L. L. Longsdorf. Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 569, Price codes: A02 in paper copy, A01 in microfiche. NOAA Technical Memorandum NWS CR-58, October 1975. 8 p.

Descriptors: *Flash floods, *Flood forecasting, *Rainfall, *Radar, Forecasting, Floods, Thunderstorms, Precipitation (Atmospheric), Excessive precipitation, Streamflow, Runoff, Hydrology, Meteorology.

This technical note was devised to provide all offices with guidelines for determining the threat and extent of flash floods and other small tributary floods. Basically, these guidelines involve knowledge of when, how much, and how fast rain came down; how much of a particular river basin was involved; and some method for converting this data to river stage or flood potential. Procedures for using radar and rainfall measurements for prediction of flash floods were presented. (Sims-ISWS) W77-03114

PLASTIC-REINFORCED ASPHALT SEEPAGE BARRIER, Arizona Water Resources Research Center, Tucson. For primary bibliographic entry see Field 3B. W77-03120

TWO DIMENSIONAL BOTTOM WITHDRAWAL FROM A DENSITY-STRATIFIED RESERVOIR, Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering. J. C. Ho, and P. L. Monkmeier.

Proc. International Association for Hydraulic Research, XVth Congress, p 79-86, 1975. 4 fig, 10 ref. OWRT B-080-WIS(7), 14-31-0001-3948.

Descriptors: *Model studies, Engineering, *Equations, *Reservoir releases, *Density currents, *Stratification, *Withdrawal, Model studies. Identifiers: *Viscous flow, *Transition flow, *Sinks, *Karman integral method.

Theoretical and experimental investigations are discussed on two-dimensional withdrawal of a viscous, non-diffusive and linearly-stratified fluid from the bottom of a reservoir. To account for the non-linear, inertial terms, a Karman integral method is used to solve the governing differential equations. A program of experiments is carried out in the laboratory and the results obtained indicate conclusively the adequateness of the relatively simple form of the horizontal velocity profile assumed and confirm very well theoretical relations for the withdrawal layer thickness and maximum horizontal velocity. W77-03129

A PERTURBATION APPROACH TO TWO-DIMENSIONAL BOTTOM WITHDRAWAL FROM A DENSITY-STRATIFIED RESERVOIR, Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering. J. C. Ho, and P. L. Monkmeier. Engineering Journal of Singapore, Vol. 2, 1975, p. 12-20. 2 fig, 5 ref. OWRT B-080-WIS(6), 14-31-0001-3948.

Descriptors: *Model studies, Engineering, *Equations, *Reservoir releases, *Density currents, *Stratification, *Withdrawal. Identifiers: *Viscous flow, *Transition flow, *Perturbation method.

A perturbation method is used to study two-dimensional withdrawal of a viscous, non-diffusive, linearly-stratified fluid from the bottom of a reservoir. From the perturbation analysis, a criterion is developed to determine the validity of the linear solution obtained by Wales and Monkmeier. W77-03151

AN APPRAISAL OF CONFLICTING INSTITUTIONAL ATTITUDES ON THE WESTWIDE STUDY REPORT, Idaho Univ., Moscow. Water Resources Research Inst. For primary bibliographic entry see Field 6B. W77-03157

PRACTICAL ALTERNATIVES TO 2,4,5-T FOR CHEMICAL CONTROL OF BRUSH ALONG DRAINAGE DITCHES AND GENERAL WATERSHED USE, Purdue Univ., Lafayette, Ind. Water Resources Research Center. For primary bibliographic entry see Field 5G. W77-03168

MULTIPLE USE IN THE SOUTHERN COASTAL PLAINS IN THE UNITED STATES, Georgia Univ., Athens. School of Forest Resources. For primary bibliographic entry see Field 4C. W77-03173

FLOOD PLAIN INFORMATION: TUSCARAWAS AND ADJACENT TRIBUTARY AREAS, TUSCARAWAS COUNTY, OHIO, Army Engineer District, Huntington, W. Va. Prepared for the Ohio Department of Natural Resources, June 1973. 28 p, 9 fig, 17 plates, 6 tab.

Descriptors: *Floods, *Streamflow forecasting, *Flood profiles, *Flood plains, *Flood data, *Dams, *Reservoirs, *Ohio, Peak discharge, Obstruction to flow, Channel improvement. Identifiers: *Tuscarawas River(OH), Sugar Creek(OH), Dover Dam, Beaverdam Creek(OH), Stillwater Creek(OH), Little Stillwater Creek(OH), Intermediate Regional Flood, Standard Project Flood.

The Tuscarawas River, draining 2,590 square miles, constitutes nearly 1/3 of the total Muskingum River Basin in central Ohio. The 42 river miles covered in this report slope at 2.1 feet per mile and are joined by 24.19 miles of tributaries which include Sugar Creek, Beaverdam Creek, Stillwater Creek, and Little Stillwater Creek. The meandering river, with valley widths ranging between 500 and 6,000 feet, flows westward, then southwesterly through agricultural lands interspersed with some industrial, commercial and residential development. Floods occur during all seasons, though the largest have occurred in the period of December to March. Along tributaries flood stages rise to peaks with high velocities in a relatively short period of time. On the river, a flood rises to its crest over a longer period. Flood damage reduction measures include 8 reservoirs as well as a channel improvement project on Little Stillwater Creek. The greatest flood occurred in March 1913, which crested at 806.5 msld with a peak discharge of 830,000 cubic feet per second. Loss was over \$200,000. Damage in a 1935 flood was \$6 million. An Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) can be expected to crest at 793.2 msld and 799.3 feet msld respectively. Most bridges in the study area would obstruct flow during an SPF. During major floods water velocities in the Tuscarawas River channel range up to about 4.5 ft/sec. Velocities on tributary streams having steeper gradients may be even higher. Overbank velocities are about 2 ft/sec on the river and as high as 3.2 ft/sec on tributary streams. (Salzman-North Carolina) W77-03174

FLOOD PLAIN INFORMATION: KASKASKIA RIVER AND TRIBUTARIES, COLES COUNTY, ILLINOIS, Army Engineer District, St. Louis, MO. Prepared for the County of Coles, Illinois, August 1972. 28 p, 10 fig, 22 plates, 4 tab.

Descriptors: *Floods, *Historic floods, *Flood damage, *Flood protection, *Flood plains, *Flood profiles, *Illinois, Flood data, Control structures, Levee, Channel improvement. Identifiers: *Kaskaskia River(IL), Flood Plain Management Program, Crabapple Creek(IL), Whitley Creek(IL), Flat Branch(IL), Coles County(IL), Standard Project Flood, Intermediate Regional Flood.

Kaskaskia River flows through the undulating prairie of Coles County in southeastern Illinois and falls 17.6 feet in 20.6 miles through the study reach. The river drains about 400 square miles above Coles County. Its tributaries, Crabapple Creek, Whitley Creek and Flat Branch flow westerly into the river and have flood plains which vary from 125 to 1,500 feet. Kaskaskia River's flood plains, varying from 200 to 12,000 ft wide, consist of farmlands. Floods occur during all seasons with a relatively fast rate of rise, particularly in winter when rains fall on frozen ground. Most floods result from intense rainfall. Bridges, culverts and buildings and natural obstructions impede flood flow. Channel improvements along some of the tributaries and privately built levees have reduced damage from low-frequency floods but would not protect against the Intermediate Regional Flood or Standard Project Flood. The largest flood occurred on June 28, 1957, in the aftermath downpour from Hurricane Audrey. The Kaskaskia River crested at 636.2 feet (msld). Forty thousand acres of farmland were flooded and many families were forced to evacuate their

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control Of Water On The Surface

homes. An IRF and SPF have estimated elevations of 640.2 (msld) and 646.2 (msld) and peak discharges of 19,675 cubic feet per second and 52,448 cfs, respectively. Water velocities would be up to 5 ft/sec in the channel. (Salzman-North Carolina) W77-03175

FLOOD PLAIN INFORMATION: SAN JUAN RIVER AND TRIBUTARIES, FARMINGTON, NEW MEXICO.

Army Engineer District, Sacramento, Calif. Prepared for the City of Farmington and San Juan County, June 1975. 53 p, 20 fig, 37 plates, 7 tab.

Descriptors: *New Mexico, *Floods, *Flood profiles, *Historic floods, *Flood plains, *Flood protection, Flash flood, Streamflow forecasting, Maximum probable flood, Cloudbursts, Flood data, Flood frequency, Peak discharge, Flood peak, Erosion, Floodways, Non-structural alternatives, Building codes, Zoning, Control structures, Dams, Channel improvement, Floodproofing.

Identifiers: *Farmington(NM), *Animas River(NM), *Hood Arroyo(NM), *San Juan River(NM), *Farmington Glade(NM), *Wyper Arroyo(NM), *La Plata River(NM), *Porter Arroyo(NM), *Flora Vista Arroyo(NM), Standard Project Flood, Intermediate Regional Flood.

Properties along the streams are primarily agricultural and rural-residential. Population of Farmington, NM, is about 28,000 and is expected to reach 50,000 by year 2000. La Plata and Animas Rivers and Farmington Glade are tributaries of San Juan River. Four arroyos, Porter, Hood, Wyper and Flora Vista, are tributaries of Animas River. The San Juan River drains 7,250 sq mi at the downstream end of the study reach and the other streams drain areas varying from 1 to 1,360 sq mi. Floods can be caused by general rainfall, usually in September and October, snowmelt in May through July, and summer cloudburst storms. The 1911 flood is considered the largest ever known in the Farmington area with an estimated peak flow of 30,000 cubic ft per second on the Animas River at Farmington. In an Intermediate Regional Flood, peak discharges of 34,500 cfs and 30,000 cfs are expected on San Juan, La Plata and Animas Rivers, respectively. The other streams will have varying discharges below 4,000 cfs. Water velocities will be 6 to 11 ft/sec in channels and 2 to 4 ft/sec in overbank areas. Floods would peak between 2.5 and 23.5 hrs, depending on the stream and remain at critical stage up to 66 hrs. In a Standard Project Flood, peak discharges of 50,000 cfs, 22,000 cfs and 45,000 cfs are predicted on San Juan, La Plata and Animas Rivers, respectively. The other streams will have discharges less than 10,000 cfs. This flood would peak in 2.5 to 29 hrs and remain at critical stage up to 93 hrs. Some of the 30 culverts, bridges, flumes and other structures will be obstructive to flow. Navajo Reservoir, 40 mi upstream from Farmington on San Juan River, provides some flood protection. Guidelines for reducing flood damages are included. (Smith-North Carolina) W77-03176

FLOOD PLAIN INFORMATION: CONTOOCOOK RIVER AND NUBANUSIT BROOK, PETERBOROUGH, NEW HAMPSHIRE.

Army Engineer District, Waltham, Mass. New England Div. April 1974. 35 p, 21 fig, 18 plates, 6 tab.

Descriptors: *Floods, *Flood data, *Flood stages, *Peak discharge, *Flood characteristics, *Bank erosion, *Flood plains, *Channels, *Ice jams, *Flood protection, *Dams, Flood flow, Historic floods, Flow duration, Control structures, *New Hampshire, Flood profiles.

Identifiers: *Contoocook River(NH), Nubanusit Brook(NH), Peterborough(NH), Flood Plain Management Program, MacDowell Reser-

voir(NH), Intermediate Regional Flood, Standard Project Flood.

The Contoocook River flows northerly through Peterborough, NH and discharges into the Merrimack River. With a total drainage area of 151 square miles above the study area, the river has a very steep, narrow stream valley through town's business district, sloping at an average of 16.1 feet per mile. Nubanusit Brook, which joins the river at Peterborough, drains 47 square miles and has a slope averaging 69.3 ft per mile. Flood plains in study area include residential, industrial and commercial property; however, deep channels confine most flooding within banks except beyond the business district where streams meander through broader flood plains. The MacDowell Flood Control Reservoir (1950) on the Nubanusit Brook minimizes flooding. Ice jams resulting from spring melting still constitute a problem. Floods occur during all seasons. River stages rise rapidly because of the river's numerous steep tributaries. September 1938 marked the greatest flood on the Contoocook River, cresting at 746.8 ft mean sea level datum, with a peak discharge of 5,950 cubic ft/sec. Damage was over \$500,000. An Intermediate Regional Flood and Standard Project Flood would have estimated peak discharges of 6,650 cfs and 10,650 cfs, respectively. Water velocities could reach 14 ft/sec in major floods. Similar flood conditions would result on Nubanusit Brook. Few bridges in the area would obstruct flood flow. (Salzman-North Carolina) W77-03177

FLOOD PLAIN INFORMATION: CHICOPEE RIVER: CHICOPEE, SPRINGFIELD, LUDLOW, WILBRAHAM AND PALMER, MASSACHUSETTS.

Army Engineer District, Waltham, Mass. New England Div. September 1973. 38 p, 20 fig, 10 plates, 5 tab.

Descriptors: *Floods, *Runoff, *Flood plains, *Flood protection, *Control structures, Flow duration, Flow characteristics, Flood data, Channel improvements, Floodwalls, Dams, Reservoirs, Planning, Obstruction to flow, Flood profiles, *Massachusetts.

Identifiers: *Chicopee River(MA), Quabog River(MA), Ware River(MA), Swift River(MA), Springfield(MA), Chicopee(MA), Palmer(MA), Ludlow(MA), Wilbraham(MA), Flood damage reduction measures, Bare Falls Dam(MA), Conant Brook Dam(MA).

Flowing from its source at the confluence of the Ware and Quabog Rivers near the community of Three Rivers in the town of Palmer, to its confluence with the Connecticut River at Chicopee, the river drains 721 sq mi and has three principal tributaries: the Quabog, Ware and Swift Rivers. A number of smaller streams in the river system can also be sources of high runoff during intensive rain or rapid snowmelt. Certain areas of the usually narrow flood plain extend to 2,000 feet and contain residential, commercial and industrial development as well as open spaces under increasing pressure for development. Each of the five towns can be severely damaged by future floods. Floods occur during all seasons, particularly in Spring when snowmelt augments rainfall. Peak flood stages occur 6 to 24 hours after intense rainfall. Most of the 14 bridges spanning the river would obstruct flood flows in an Intermediate Regional Flood (IRF). Flood damage reduction measures include several local protection flood control projects, such as channel modifications, flood walls, dams and reservoirs. Highest recent flood occurred August 19, 1955 when the river crested at 22.14 ft and had a peak discharge of 40,500 cubic ft/sec. An IRF would crest at 16.5 ft, have a peak discharge of 35,500 cfs with channel velocities of 6.9 ft/sec. A Standard Project Flood would crest at 26.6 ft and have a peak discharge of 77,800 cfs with velocities averaging 8 to 12 ft/sec. (Salzman-North Carolina) W77-03178

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA: VOLUME I, SUMMARY REPORT; SALT CREEK, HAINES BRANCH AND BEAL SLOUGH, SALT CREEK BASIN.

Army Engineer District, Omaha, Nebr. Prepared for Lincoln City-Lancaster County Planning Commission. August 1964. 10 p, 5 fig, 14 plates.

Descriptors: *Nebraska, *Floods, *Flood profiles, *Historic floods, *Flood plains, Storms, Flood data, Snowmelt, Flood protection, Non-structural alternatives, Flood plain zoning, Building codes, Control structures, Reservoirs, Floodproofing. Identifiers: Lincoln(NB), Beal Slough(NB), Salt Creek(NB), Haines Branch(NB), 25-year flood, 100-year flood.

The lower portions of the watersheds of the streams of this study are generally developed in and around Lincoln, NB, while the upper portions are used for crops or pasture. Haines Branch is a tributary of Salt Creek which is formed by the junction of the Olive and Hickman Branches. Beal Slough enters Salt Creek at Lincoln. Lincoln continues to grow and its 1960 population of 128,000 is expected to reach 231,000 by 1980. Flooding can be caused by heavy general rains in spring and summer, combined with snowmelt. On rare occasions snowmelt alone causes flooding. Since 1900, 100 floods have been recorded along Salt Creek and tributaries, of which 17 were major, 30 were moderate and 49 were minor. Two inflicted catastrophic damages. The highest peak discharge was 30,650 cubic ft/sec in a 1908 event. A 1950 flood had a peak of 28,200 cfs and caused damages of \$1.6 million in Lincoln. No predictions of peak discharges for future large floods is contained in this report, but flood plains are delineated on maps for the 25-year and 100-year flood. Guidelines are given for floodplain management. At the time of this report, 5 storage structures on upstream tributaries of Salt Creek and one on a Haines Branch tributary had been authorized. For detailed flood plain and technical information consult the main report. (Smith-North Carolina) W77-03179

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA: VOLUME II, SUMMARY REPORT, ANTELOPE CREEK, DEAD MANS RUN, AND MIDDLE CREEK, SALT CREEK BASIN.

Army Engineer District, Omaha, Nebr. Prepared for Lincoln City-Lancaster County Planning Commission, April 1966. 10 p, 5 fig, 20 plates.

Descriptors: *Nebraska, *Floods, *Flood profiles, *Flood plains, *Flood protection, Flood forecasting, Historic floods, Non-structural alternatives, Building codes, Control structures, Water control. Identifiers: *Antelope Creek(NB), Dead Mans Run(NB), *Middle Creek(NB), Lincoln(NB), 25-year flood, 100-year flood, Flood plain zoning.

Antelope Creek and Dead Mans Run are right bank tributaries of Salt Creek and rise within the Lincoln metropolitan area. They drain 14 and 10.5 sq mi, respectively. Middle Creek, a left bank tributary of Salt Creek, drains about 100 sq mi. Urban development is concentrated within Lincoln city limits, while other lands are more rural and devoted to pasture and crops. Lincoln and vicinity are expected to continue to grow, so that staggering losses which have occurred in flood plains in the past may be increased unless flood protection is established. Floods generally occur in spring and summer months and are sometimes increased by snowmelt. On rare occasions snowmelt alone may cause flooding. Since 1900, 8 floods in the Antelope Creek basin have been recorded and heavy damages have occurred. No floods have been recorded on Middle Creek and two floods have occurred on Dead Mans Run. A 1951 flood on Antelope Creek caused damages estimated at

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Control Of Water On The Surface—Group 4A

\$472,000. This report does not predict peak discharges of possible future large floods, but information on 25-year floods and 100-year floods is given in the form of flood plain delineation maps. Minor flood protection has been given by construction of 3 storage structures, one on Antelope Creek near Van Dorn Street, two on the upstream reaches of Middle Creek. At each of the stream's confluences with Salt Creek, a protective works to guard against backwater effects of Salt Creek is proposed. Guidelines for floodplain management are given. (Smith-North Carolina)
W77-03180

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA, VOLUME III, SUMMARY REPORT, LITTLE SALT, OAK, SALT, AND STEVENS CREEK, SALT CREEK BASIN.

Army Engineer District, Omaha, Nebr.
Prepared for Lincoln City-Lancaster County Planning Commission, September 1967. 12 p, 7 fig, 30 plates.

Descriptors: *Nebraska, *Floods, *Flood profiles, *Flood plains, Historic floods, Peak discharge, Flood protection, Non-structural alternatives, Control structures, Dams, Channel improvement. Identifiers: *Little Salt Creek(NB), *Oak Creek(NB), *Salt Creek(NB), *Stevens Creek(NB), Lincoln(NB), 25-year flood, 100-year flood.

Little Salt and Oak Creeks are left bank tributaries of Salt Creek and drain 47 and 272 sq mi, respectively. Stevens Creek, a right bank tributary, drains 55 sq mi and enters Salt Creek just downstream of Lincoln. Except for the metropolitan reach of Oak Creek and several rural communities, the basins of the tributary streams of this report are undeveloped. Salt Creek, which drains 1,627 sq mi has, in contrast, major development along it within the city limits of Lincoln. Although Lincoln is predicted to continue its growth, little expansion is expected in the reaches of these streams. Floods occur most often in spring and summer months, when rain is heavy or is combined with snowmelt. On rare occasions snowmelt alone can cause flooding. Only two minor floods have occurred on Oak Creek, in 1945 and 1947 and damage was relatively small. Since 1900, 17 major and 83 minor floods have been recorded on Salt Creek and major damage has been caused. In a 1951 flood a peak discharge of 28,200 cubic ft/sec was recorded. Peak discharges for possible future large events are not given, but flood plain delineation maps which show the extent of 25-year and 100-year floods are included. Some channel improvement has taken place on Oak and Salt Creeks, but protection is small. A Corps of Engineers project which includes dams and other possible improvements would aid in flood protection. Guidelines for floodplain management are given. (Smith-North Carolina)
W77-03181

FLOOD PLAIN INFORMATION: WILDCAT CREEK AND KOKOMO CREEK, VICINITY OF KOKOMO, HOWARD COUNTY, INDIANA.

Army Engineer District, Louisville, Ky.
Prepared for the City Planning Commission of Kokomo and Howard County Planning Commission, July 1972. 42 p, 17 fig, 11 plates, 11 tab.

Descriptors: *Floods, *Flooding, *Flood forecasting, *Flood data, *Flood protection, *Non-structural alternatives, *Flood plain zoning, *Levees, *Indiana, Runoff, Flood flow, Historic floods, Flood stages, Peak discharge, Flow duration, Flow characteristics, Flood damage, Flood plains, Obstructions to flow, Flood profiles, Flash floods. Identifiers: *Wildcat Creek(IN), *Kokomo Creek(IN), Kokomo(IN), Howard County(IN), Standard Project Flood, Intermediate Regional Flood.

This report covers 12.2 miles of Wildcat Creek, from mile 58 to the dam at the Kokomo Waterworks Reservoir at mile 70.2, and Kokomo Creek, from its mouth to the gaging station at mile 4.42. Varying in width from 200 to 500 feet, the flood plains have industrial, commercial and residential developments in and near Kokomo. Within the study reach, the stream beds fall at an average of 7.3 feet per mile. Main flood season occurs in winter and early spring resulting from heavy rains; however, summer thunderstorms can create flooding conditions also. In the open channels, water velocities range up to 13.8 ft/sec and floods have a relatively short duration and fast rate of rise. Flood damage prevention measures include structural levees, flood plain zoning, subdivision regulations and flood warning and forecasting services. Natural obstructions as well as 46 bridges, 4 dams, and levees impede flood flows. Although the greatest known flood occurred in March 1913, the largest recorded flood was in April 1964 with an elevation of 817.6 feet (gage zero is 755.62 feet). Similar levels of flooding occurred on Wildcat Creek. An Intermediate Regional Flood and Standard Project Flood on Kokomo Creek are estimated to crest at 818.9 ft and 829 ft, and have peak discharges of 2,300 cubic feet per second and 6,500 cfs respectively. On Wildcat Creek the IRF and SPF would peak at 16,200 cfs and 4,500 cfs respectively. (Salzman-North Carolina)
W77-03182

FLOOD PLAIN INFORMATION: SCIOTO AND OLENTANGY RIVERS, OHIO, COLUMBUS AREA, SUMMARY REPORT.

Army District Engineers, Huntington, W. Va.
Prepared for the State of Ohio Department of Natural Resources. Prepared by Dodson, Kinney and Lindblom, Columbus, October 1966. 23 p, 16 fig, 13 plates, technical append.

Descriptors: *Ohio, *Floods, *Non-structural alternatives, *Control structures, *Flood plains, Flood profiles, Obstructions to flow. Identifiers: *Scioto River(OH), *Oleontangy River(OH), Chillicothe(OH), Columbus(OH), Julian Griggs Reservoir(OH), Paint Creek(OH), North Fork(OH).

This report covers Scioto and Olentangy Rivers in the Columbus OH area and the Scioto River, Paint Creek and its tributary, North Fork, in the Chillicothe OH area. In Columbus, the Scioto's flood plains as well as the narrow flood plains of the Olentangy are extensively developed with residential and commercial properties, bridges and roadways. Outside of the urban area, the flood plains are primarily for agricultural purposes. The greatest flood occurred in March 1913 causing damages to \$5.6 million. This could be repeated in the future. Flood control improvements include 4 reservoirs, of which only one has been built, channel improvements, levees and a variety of flood plain regulations. Guidelines for reducing future flood damages are outlined. These measures include: (1) flood control works such as dams and reservoirs, levees, flood walls, channel improvements and watershed treatment; and (2) flood plain management techniques such as channel and floodway encroachment lines, zoning ordinances, subdivision regulations, building codes, flood-proofing and warning systems. This report serves as a guide for adoption of suitable flood plain regulations and management techniques. (Salzman-North Carolina)
W77-03183

JOINT PROBABILITY METHOD OF TIDE FREQUENCY ANALYSIS APPLIED TO APALACHICOLA BAY AND ST. GEORGE SOUND, FLORIDA.

National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2L.
W77-03304

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST REPORT.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03306

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX A, OPERATIONAL AND WATER QUALITY DATA, 1968.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03307

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX B, OPERATIONAL AND WATER QUALITY DATA, 1969.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03308

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX C, OPERATIONAL AND WATER QUALITY DATA, 1970.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03309

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX D, EFFECTS OF ARTIFICIAL DESTRATIFICATION ON TEMPERATURE AND DISSOLVED OXYGEN IN ALLATOONA RESERVOIR.
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 5G.
W77-03310

HYDROLOGY AND ENVIRONMENTAL ASPECTS OF ERIE CANAL (1817-99).
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 8B.
W77-03334

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ABOVE SHERWOOD ROAD ON WEST BRANCH DELAWARE RIVER, DELHI, NEW YORK.
Geological Survey, Albany, N. Y. Water Resources Div.
B. Dunn, and T. J. Zembrzski, Jr.
Open-file report 76-778, November 1976. 10 p, 3 fig, 4 tab, 6 ref.

Descriptors: *Flood flow, *Flood frequency, *Flood recurrence interval, *Bridge design, Streamflow, Hydraulic properties, Flow characteristics, Flow resistance, Flood forecasting, *New York.
Identifiers: *West Branch Delaware River(NY), *50-year flood, *100-year flood.

An evaluation of floodflow characteristics for a 50- and 100-year flood was made for a proposed bridge site across West Branch Delaware River in Delaware County, N.Y. Several design conditions were analyzed for their effect on the 100-year profile. Analyses were made to determine the effect of both removal and retention of the existing Sherwood Road bridge and roadway embankment 750 feet downstream from the proposed site. The normal water-surface elevation (without the bridge) at the proposed site would be 1,345.2 feet for the 50-year flood and 1,345.6 feet for the 100-year flood if the existing Sherwood Road bridge and embankment were retained, and would be 1,344.8 feet and 1,345.1 feet for the 50- and 100-year flood, respectively, if the bridge and roadway embankment were removed. The magnitudes of the 50- and 100-year floods at the proposed site would be 8,300 cubic feet per second and 9,300 cubic feet per second, respectively. (Woodard-USGS)

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control Of Water On The Surface

W77-03337

NATIONAL PROGRAM FOR MANAGING FLOOD LOSSES: GUIDELINES FOR PREPARATION, TRANSMITTAL, AND DISTRIBUTION OF FLOOD-PRONE AREA MAPS AND PAMPHLETS.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03341

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, AUGUST 1968 - JANUARY 1975.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-03343

DEPTH AND FREQUENCY OF FLOODS IN ILLINOIS.
Geological Survey, Champaign, Ill. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-03346

PROBABLE MAXIMUM FLOOD AT LAKE CHIPPEWA NEAR WINTER, WISCONSIN.
Geological Survey, Madison, Wis. Water Resources Div.
W. R. Krug.
Open-file report 76-800, November 1976. 14 p, 7 fig, 3 tab, 6 ref.

Descriptors: *Maximum probable flood, *Lakes, Dams, *Simulation analysis, *Reservoir operation, Streamflow, Inflow, *Wisconsin.
Identifiers: *Lake Chippewa(Wisc).

The probable maximum flood was computed for Lake Chippewa, Wisconsin, and routed through the lake to determine maximum lake stage. The peak discharge of the probable maximum flood at Lake Chippewa was computed to be about 75,000 cubic feet per second, primarily caused by rainfall on the lake. A secondary peak of about 41,000 cubic feet per second was due to streamflow entering Lake Chippewa. The 14-day volume of this flood was 450,000 acre-feet. Using an assumed operating procedure for Winter Dam, the maximum lake stage for the probable maximum flood was computed to be about 1,318 feet above mean sea level—about 3 feet below the dam crest and 6 feet above the proposed normal summer operating level. The probability of this flood occurring in any year is less than 1 in 10,000. (Woodard-USGS)
W77-03349

PROJECTIONS OF POPULATION, EMPLOYMENT, INCOME AND WATER USE FOR IOWA RIVER BASINS, 1975-2020.
Iowa Univ., Iowa City. Inst. of Economic Research.
For primary bibliographic entry see Field 6D.
W77-03342

THE OBJECTIVES, PART I OF THE STATE WATER PLAN, (IDAHO WATER RESOURCES BOARD).
Idaho Water Resource Board, Boise.
For primary bibliographic entry see Field 6B.
W77-03344

WATER FOR NEVADA. WATER PLANNING REPORT.
Nevada Div. of Water Resources, Carson City. Office of State Engineer.
For primary bibliographic entry see Field 6B.
W77-03345

FEASIBILITY OF TRANSPLANTATION, REVEGETATION, AND RESTORATION OF EELGRASS IN SAN DIEGO BAY, CALIFORNIA.
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5G.
W77-03346

IOWA'S WATER RESOURCES PROGRAM PROGRESS AND NEEDS.
Iowa Natural Resources Council, Des Moines.
For primary bibliographic entry see Field 6B.
W77-03347

PLAN FOR IMPROVEMENT OF THE DELTA LEVEES.
California State Dept. of Water Resources, Sacramento.
Bulletin No. 192, May 1975. 28 p, 7 fig, 3 tab.

Descriptors: *Flood control, *Levees, *Deltas, *California, Multiple-purpose projects, Recreation facilities, Shore protection, Cost-benefit analysis, Estimated costs, Capital costs, Annual costs, Estimated benefits, Financing, Design.
Identifiers: *Sacramento-San Joaquin Delta(Calif).

A plan to solve some of the Sacramento-San Joaquin Delta flood control, levee maintenance, shortage of public access and recreation facilities, and lack of adequate land use control problems is proposed. A total of 310 miles of levees that surround portions of 55 islands or tracts would be improved, 45 miles to a 100-year flood level and 265 miles to provide 50-year protection. The latter would only be adequate for agricultural land use. The plan also provides for 50 recreation access sites, 40 of which would be for fishing access, improved roads, and enhancement of the environment. The preliminary capital cost is estimated to be \$128 million to be shared by federal, state and local sources on a 50%, 30%, 20% basis respectively. About 90% of this total cost involves flood control measures. Annual operation, maintenance, and replacement costs of approximately \$1.1 million would be funded by local and state groups. The project is expected to be completed over a 20-year period. An economic analysis of the project indicates that approximately \$7 million of primary direct annual benefits would accrue from the project compared to an estimated total equivalent annual cost of \$5.5 million. In addition, large secondary monetary benefits and social and environmental benefits are anticipated. (Luedtke-Wisconsin)
W77-03350

THE CALIFORNIA STATE WATER PROJECT IN 1975.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6B.
W77-03351

HYDROLOGIC INVENTORY OF THE SAN RAFAEL STUDY UNIT.
Utah Div. of Water Resources, Salt Lake City.
January 1976. 93 p, 34 fig, 17 tab.

Descriptors: *Watershed management, *Hydrologic budget, *Water management(Applied), *Utah, *River basins, Planning, Water resources development, Impoundments, Reservoirs, Hydrologic cycle, Water balance, River basin development, Optimum development plans, Tributaries.
Identifiers: *San Rafael River(Utah).

As part of Utah's state water plan, the water resources of the San Rafael River basin are categorically reported, including historical elements, climatological factors, the water budget,

water quality parameters and water management aspects. The report culminates an effort to determine the normal amount of water yielded in the basin, its location, present uses, water quality and potential developmental uses. Historical flow records show an average surplus of 80,000 acre-feet of storable, good quality water in the basin. However, impoundments on the major tributaries to insure agricultural water supplies mean that large water development programs are only possible on the San Rafael River proper, where enough return flows augment spring runoff and summer thundershowers to provide adequate quantities of water. But estimation and planning for the use of this return flow will be feasible only when storage and release data are provided for the new tributary reservoirs. Water quality studies are needed at the most probable main stem dam site to determine sediment deposition rates and dissolved ion concentrations relative to long term upstream gages. Further studies are needed of arable lands and/or coal-fired electric power generation locations. Sprinkler application and canal lining will probably be intermediate steps between present flood irrigation and downstream development. (Harris-Wisconsin)
W77-03352

THE STATE OF UTAH WATER - 1975.
Utah Div. of Water Resources, Salt Lake City.
For primary bibliographic entry see Field 6B.
W77-03359

THE STATE OF UTAH WATER.
Utah Div. of Water Resources, Salt Lake City.
For primary bibliographic entry see Field 6D.
W77-03360

IOWA WATER RESOURCES FRAMEWORK STUDY PLAN OF STUDY.
Iowa Natural Resources Council, Des Moines. Technical Coordinating Committee.
For primary bibliographic entry see Field 6B.
W77-03361

CONDUCTING SEWER SYSTEM EVALUATIONS FOR SMALL SYSTEMS.
For primary bibliographic entry see Field 5D.
W77-03381

CALIFORNIA WATER PROJECT: LAW AND POLITICS.
California Univ., Berkeley. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W77-03383

CORPS' NEW LOOK IN FLOOD CONTROL: NO DAMS, LEVEES.
M. Zeldin.
Audobon, Vol 77, p 103-04, July 1975. 2 p.

Descriptors: *Nonstructural alternatives, *Administrative agencies, Civil engineering, *Floodproofing, *Flood control, Flood damage, Flood discharge, Flood plain insurance, Flood protection, Flood routing, Relocation, Dams, Water control, Water storage, Barriers, Dam construction, Surface drainage, Surface runoff, Surface waters.
Identifiers: *Army Corps of Engineers, *Water Resources Development Act.

The Army Corps of Engineers has always been known for its policy of 'build now, and then build some more later'. This policy is changing under the terms of Section 73 of the Water Resources Development Act. It requires all federal agencies planning flood control projects to give consideration to nonstructural alternatives to prevent or reduce flood damages. This includes floodproofing of structures, floodplain regulation and acquisition, and relocation where necessary. Environ-

mental groups will now, for the first time, have a chance to work with the Corps of Engineers in planning suitable construction projects and recommending alternatives. Examples of the Corps' new and milder tactics can be found at Prairie du Chien, Wisconsin, the Charles River watershed, Massachusetts, and the Chatfield Dam on the South Platte River, not far from Denver, Colorado. (Frank-Florida)
W77-03593

4B. Groundwater Management

THE TRANSPORT OF POLLUTANTS IN GROUND WATER, (IN GERMAN), California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-03131

THE OCCURRENCE OF GROUNDWATER IN THE SATPURA REGION OF CENTRAL INDIA, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
V. W. Uhl.
Master of Science Thesis, 1976. 135 p., 42 fig, 21 tab, 26 ref.

Descriptors: *Groundwater, *Water supply, *Well data, *Groundwater availability, *Groundwater mining, Crystalline rocks, Basalts, Sandstones, Shales, Geology, Alluvium, Wells, Water sources, Aquifers, Pumping, Recharge, Discharge(Water), Water types, Subsurface waters, Dug wells, Water wells, *Arizona.
Identifiers: Satpura region(Ariz).

The drilling of 500 tube wells in the Satpura region of Central India is described. The geology of the area, the history of water development there, and the impact of improved water services are discussed. Geologically, the area is underlain by crystalline rocks, basalts and sandstones. Groundwater flow systems are of the local and intermediate type. Well data are analyzed, and the results presented. Wells drilled in valleys and flat uplands were the most productive and average well yields in crystalline rocks were greater than those in basalts or sandstones. Topographic location and fracturing were considered to be the predominant factors affecting well yields in the crystalline rocks. Well yield and specific capacity results were compared to results from areas of similar geology. (Jamaal-Arizona)
W77-03146

HYDROGEOLOGY OF THE MISSOURI RIVER FLOOD PLAIN NEAR GLASGOW, MISSOURI, Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-03164

A COMPUTER PROGRAM FOR ESTIMATING COSTS OF OWNING AND OPERATING AN IRRIGATION WELL UNDER CONDITIONS OF DECLINING WATER LEVELS, Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W77-03211

NORMAL-MODE ANALYSIS OF THE STRUCTURE OF BASEFLOW RECESSON CURVES, Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W77-03313

LOW FLOW MODELING IN SMALL STEEP WATERSHEDS, Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.

W77-03316

MEASURED AND SIMULATED GROUND-WATER LEVELS IN THE FRANKLIN AREA, SOUTHEASTERN VIRGINIA, Geological Survey, Albany, N. Y. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03326

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN SIMON AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA, AND IN HIDALGO COUNTY, NEW MEXICO--1975, Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03327

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN BERNARDINO VALLEY AREA COCHISE COUNTY, ARIZONA--1975, Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03328

GROUND-WATER LEVELS IN NEW MEXICO, 1975, Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03330

HYDRAULIC CHARACTERISTICS OF THE PINEY POINT AQUIFER AND OVERLYING CONFINING BED NEAR DOVER, DELAWARE, Geological Survey, Parkville, Md. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-03331

GROUND-WATER QUALITY DATA FOR GEORGIA, Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03333

BURIED AQUIFERS IN THE BROOTEN-BELGRADE AND LAKE EMILY AREAS, WEST-CENTRAL MINNESOTA--FACTORS RELATED TO DEVELOPING WATER FOR IRRIGATION, Geological Survey, St. Paul, Minn. Water Resources Div.
R. J. Wolf.
Water-Resources Investigations 76-100, September 1976. 72 p., 18 fig, 7 plates, 3 tab, 16 ref.

Descriptors: *Groundwater resources, *Irrigation wells, *Water yield, *Aquifer characteristics, *Water quality, *Minnesota, Hydrogeology, Well data, Test wells, Water pollution sources.
Identifiers: West-Central Minnesota, Brooten-Belgrade area(Minn), Lake Emily area(Minn).

Irrigation has given a substantial boost to the economy in the Brooten-Belgrade and Lake Emily areas of Minnesota. The surficial outwash aquifer is capable of yielding sufficient quantities of water for irrigation over half of its area; the remaining part may be supplied by deep aquifers. Buried glacial outwash and Cretaceous sand aquifers, as thick as 50 feet occur to depths of 300 feet. In places, the buried aquifers are sufficiently thick and permeable to yield large quantities of water to wells. The buried aquifers are probably narrow, elongate, truncated bodies enclosed by clay till. The Precambrian surface, ranging from 190 to 350 feet below the land surface, is the lower limit of

the buried aquifers. Water in the buried-drift aquifers is a very hard calcium magnesium bicarbonate type, suitable for irrigation needs. Water in Cretaceous aquifers, although untested, is expected to be higher in dissolved solids. Potential water problems include slow rate of recharge to buried aquifers, and head loss caused by screening of the surficial and buried aquifers in the same well, and by allowing well to flow unabated. Another potential problem is possible pollution of the buried aquifers through the boreholes of multi-aquifer wells. (Woodard-USGS)
W77-03335

APPRAISAL OF WATER RESOURCES IN THE HACKENSACK RIVER BASIN, NEW JERSEY, Geological Survey, Trenton, N. J. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-03336

PLAN OF STUDY OF THE HYDROLOGY OF THE MADISON LIMESTONE AND ASSOCIATED ROCKS IN PARTS OF MONTANA, NEBRASKA, NORTH DAKOTA, SOUTH DAKOTA, AND WYOMING, Geological Survey, Denver, Colo.
Open-file report 75-631, December 1975. 35 p., 5 fig, 2 tab, 43 ref.

Descriptors: *Groundwater resources, *Coal mines, *Montana, *Nebraska, *North Dakota, Water demand, Planning, Available water, Hydrogeology, Aquifers, Aquifer characteristics, Limestones, Rocks.
Identifiers: *Madison limestone.

A major part of the United States' coal reserves is in the Fort Union coal region of the Northern Great Plains. Large-scale development of these reserves would place a heavy demand on the area's limited water resources. Surface water is poorly distributed in time and space. Its use for coal development in parts of the area would require storage reservoirs and distribution systems, whereas in the rest of the area surface water is fully appropriated and its use would deprive present users of their supply. Preliminary studies by the U.S. Geological Survey and State agencies in Wyoming, Montana, and South Dakota indicate that the Madison Limestone and associated rocks might provide a significant percentage of the total water requirements for coal development. This report briefly summarized the present knowledge of the geohydrology of the Madison and associated rocks, identifies the need for additional data, and outlines a 5-year plan for a comprehensive study of the hydrology of these rocks. (Woodard-USGS)
W77-03338

HYDROLOGIC STUDIES BY THE U.S. GEOLOGICAL SURVEY IN OIL-SHALE AREAS OF COLORADO, UTAH, AND WYOMING, 1976, Geological Survey, Denver, Colo.
Open-file report, February 1976. 88 p., 13 fig, 12 tab, 14 ref.

Descriptors: *Water resources, *Water quality, *Oil shales, *Mine wastes, Surface waters, Groundwater, Data collections, *Colorado, *Utah, *Wyoming, Streamflow, Flow rates, Gaging stations, Reservoirs, Soil moisture, Groundwater movement, Water wells, Chemical analysis, Sediment transport, Path of pollutants, Hydrologic data.

The U.S. Geological Survey has for many years maintained a program of water-resources investigations that includes the oil-shale areas of Colorado, Utah, and Wyoming. The recent interest in oil shale has added new dimensions and greater intensity to the investigations. This report describes the water-resources investigation pro-

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

gram that is currently in operation. Locations of gaging stations and water-quality measuring sites, frequencies and parameters, and areas of groundwater studies are included. Brief descriptions of studies by investigators who are headquartered outside the Geological Survey's district operations also are included. These studies are research related to oil shale, chemical exchanges in waste material, extraction, water quality, and post-mining reclamation. (Woodard-USGS)
W77-03340

CHEMICAL COMPOSITION DATA AND CALCULATED AQUIFER TEMPERATURE FOR SELECTED WELLS AND SPRINGS OF HONEY LAKE VALLEY, CALIFORNIA.

Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-03342

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, AUGUST 1968 - JANUARY 1975.

Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-03343

HIGH-RESOLUTION SEISMIC REFLECTION PROFILING FOR MAPPING SHALLOW AQUIFERS IN LEE COUNTY, FLORIDA.

Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-03344

SUMMARY OF GEOLOGY AND GROUNDWATER RESOURCES OF PASSAIC COUNTY, NEW JERSEY.

Geological Survey, Trenton, N.J. Water Resources Div.
L. D. Carswell, and J. G. Rooney.
Water-Resources Investigations 76-75, June 1976.
47 p, 7 fig, 1 plate, 3 tab, 25 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Well data, *Water yield, *Water quality, *New Jersey, Hydrogeology, Geologic mapping, Water utilization, Groundwater recharge.
Identifiers: Passaic County(NJ).

The Brunswick Formation of Triassic age is the most important aquifer in the southeastern one-third of Passaic County, N. J. Yields of public supply and industrial wells range from 50 to 510 gal/min and the median yield is 130 gal/min. Most of these wells are 200 to 400 feet deep. The median yield of all public supply and industrial wells over 300 feet deep and 8 inches or larger in diameter is 230 gal/min. Crystalline rocks of Precambrian age are the major source of ground water for domestic use in the northwestern two-thirds of Passaic County. Well yields range from 1 to 200 gal/min. The median yield of domestic wells is 5 gal/min and that of public supply wells is 30 gal/min. Unconsolidated stratified deposits of Quaternary age are potentially an important source of ground water for future development. Yields of wells tapping the stratified deposits range from 4 to 920 gal/min. The median reported yield of domestic wells is 16 gal/min and that of public supply and industrial wells is 130 gal/min. The quality of ground water in Passaic County varies from one aquifer to another. Water from the Precambrian rocks is soft to moderately hard (34 to 104 mg/liter) and is low in dissolved solids (66 to 159 mg/liter). Water from the Brunswick Formation is moderately hard to very hard (89 to 540 mg/liter). The dissolved solids content ranges from 129 to 563 mg/liter. Groundwater pumping by the major public supply companies in the county has increased from 2.1 million

gallons per day in 1951 to 4.39 million gallons per day in 1968. (Woodard-USGS)
W77-03345

GROUNDWATER RESOURCES OF GREELEY AND WICHITA COUNTIES, WESTERN KANSAS.

Geological Survey, Lawrence, Kans. Water Resources Div.; and Geological Survey, Lawrence, Kans.
S. E. Slagle, and E. C. Weakly.
Kansas Geological Survey, Lawrence, Irrigation Series No 2, June 1976. 21 p, 10 fig, 3 plates, 3 tab, 41 ref, append.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water yield, *Water quality, Water utilization, Irrigation wells, Pumping, Water level fluctuations, Groundwater recharge, Available water, *Kansas.
Identifiers: Greeley and Wichita Counties(Kans), Groundwater storage.

Unconsolidated deposits of sand, silt, clay, and gravel compose the principal aquifer in Greeley and Wichita Counties, Kans. The deposits are as much as 300 feet thick, of which as much as 145 feet is saturated. In 1972, there were about 1,040 large-capacity wells yielding 100 gallons per minute or more--in the counties, mostly for irrigation supplies. The wells yield as much as 2,000 gallons per minute. Withdrawals of ground water average about 220,000 acre-feet annually. Water levels have declined in parts of the area where large-capacity wells are concentrated, resulting in as much as 60-percent reduction in saturated thickness. Water-level declines during 1948-72 ranged from less than 10 to about 55 feet. The largest decline, about 55 feet, has occurred near Leoti, in central Wichita County. As of January 1972, about 5 million acre-feet of ground water were in storage in Greeley and Wichita Counties; however, only about 70 percent of this amount is considered to be available for pumping. The water from the unconsolidated aquifer is a mixed chemical type in which calcium, sodium, and bicarbonate are the principal constituents. Generally, the water is suitable for all common domestic, stock, an irrigation uses. (Woodard-USGS)
W77-03347

SELECTED DATA ON WATER WELLS, GEOTHERMAL WELLS, AND OIL TESTS IN IMPERIAL VALLEY, CALIFORNIA.

Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03348

GROUNDWATER QUALITY ADJACENT TO A SEPTIC TANK SYSTEM.

ADI, Ltd., Fredericton (New Brunswick).
For primary bibliographic entry see Field 5D.
W77-03456

WATER MANAGEMENT AND REGULATION OF WATER USE.

Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6B.
W77-03525

SIGNIFICANCE OF NITRATES IN DRINKING WATER, (IN RUSSIAN).

Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
For primary bibliographic entry see Field 5B.
W77-03541

CALIFORNIA'S GROUND WATER.

California State Dept. of Water Resources, Sacramento. Div. of Planning.

Bulletin No. 118, September 1975. 145 p. 33 fig., 2 tab.

Descriptors: *Groundwater basins, *California, Surveys, Water supply, Water resources development, Groundwater, Water utilization, Groundwater recharge, Groundwater resources, Management, Surface-groundwater relationships, Conjunctive use.
Identifiers: Groundwater law.

Technical information on groundwater basins, the extent of their water supplies, the ways in which they have been used and misused, and better management mechanisms for the future are discussed. The usable storage capacity of California groundwater basins is about 143 million acre-feet. About 40% or 15 million acre-feet per year of California's applied water needs is obtained from them, and there is an overdraft of 2.2 million acre-feet per year. With the exception of dissolved salts problems in some basins, groundwater quality is suitable for all beneficial uses. The development of computers capable of solving many equations simultaneously has allowed use of mathematical models of the basins' hydrology to evaluate alternative water management plans. It is concluded that: (1) water could be pumped from some basins to support industries such as the thermal electric power industry, which have an economic life short enough to be supplied by the available water; (2) groundwater has been the single most important resource contributing to the present development of the state's economy and use of basin storage capacity offers the largest potential benefit from management of the state's resources, (3) some basins with large supplies of inexpensive surface water require well fields to prevent drainage problems due to rising groundwater levels. An inventory of the groundwater resources, divided into nine hydrologic study areas, is also provided. (Luedtke-Wisconsin)
W77-03548

MEETING WATER DEMANDS IN SACRAMENTO COUNTY.

California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6D.
W77-03553

GROUND WATER BASIN PROTECTION PROJECTS: FREMONT SALINITY BARRIER.

California State Dept. of Water Resources, Sacramento.
Bulletin No. 147-2, June 1975. 12 fig, 4 tab.

Descriptors: *Aquifer management, *Saline water barriers, *Groundwater recharge, Saline water, Saline water intrusion, Saline-freshwater interfaces, Seepage, Subsurface waters, Estuaries, California, Groundwater barriers, Groundwater movement, Aquifers, Reservoirs, Water pollution sources, Subsurface waters, Water resources development, Encroachment, Design, Estimated costs, Wells, Environmental effects, Well casings.
Identifiers: San Francisco Bay, Alameda County(Calif).

A salt water-intruded ground water reservoir in the Fremont area of southern Alameda County, California can be restored and maintained as a usable resource only if three simultaneous actions are taken, according to a water basin protection study: (1) planned recharge of natural and imported waters; (2) removal from the ground water reservoir of salt water remaining from earlier intrusions; and (3) installation of a barrier to prevent additional salt water from entering the reservoir. Description is given of current efforts to recharge aquifers in the Fremont ground water area through utilization of spreading basins along Alameda Creek, along with present and proposed work to remove entrapped salt water by means of aquifer reclamation wells and pumping into flood control and drainage canals. The proposed underground

sea water intrusion barrier would be installed between San Francisco Bay and the aquifers, forming an irregular line along the landward edge of the saltwater evaporation ponds west of Fremont and extending about nine miles. Estimated cost of the six-year project would be slightly more than \$3 million. A pumping type of barrier is recommended, to avoid trapping saline water in previously-unaffected areas or forcing already-intruded saline waters further inland, and to accelerate removal of entrapped saline water from the aquifer. (Harris-Wisconsin)
W77-03555

THE IMPACT OF INTENSIVE APPLICATION OF PESTICIDES AND FERTILIZERS ON UNDERGROUND WATER RECHARGE AREAS WHICH MAY CONTRIBUTE TO DRINKING WATER PROBLEMS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W77-03567

4C. Effects On Water Of Man's Non-Water Activities

RELATION BETWEEN ATMOSPHERIC POLLUTION, PRECIPITATION, AND STREAM-WATER QUALITY NEAR A LARGE URBAN-INDUSTRIAL COMPLEX.
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5B.
W77-03097

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY, PROGRESS REPORT.
Allen County Soil and Water Conservation District, Fort Wayne, Ind.
For primary bibliographic entry see Field 5G.
W77-03106

MULTIPLE USE IN THE SOUTHERN COASTAL PLAINS IN THE UNITED STATES.
Georgia Univ., Athens. School of Forest Resources.
J. T. May, J. L. Buckner, and S. J. Ursic.
Georgia Forest Research Council Report No. 35, April 1976, 23 p, 26 ref.

Descriptors: Water resources, *Multiple use, *Forest management, *Recreation, *Wildlife, *Coastal plains, *Southeast US, Lumbering, Management, Water quality, Water supply, Environment.
Identifiers: Southern Coastal Plains(US), *Multiple use management.

The timber-producing industry in the South is responding to the demand for multiple-use management by developing silvicultural practices to favor not only the major commodity, which is timber, but to favor other uses as well. Protection of water quality is emerging as the second most important factor in the multiple-use management of Coastal Plain forests—second only to wood production. Forest managers are adopting silvicultural practices to increase wildlife and recreation opportunities on their lands, and are studying the impact of silvicultural practices such as intensive management on water quality and supply and other environmental factors. (Forest Service)
W77-03173

COASTAL MORPHOLOGY AND SEDIMENTATION, GULF COAST OF ALASKA (GLACIAL SEDIMENTATION).
Rhode Island Univ., Kingston, Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-03244

SCOUR AROUND BRIDGE PIERS.
West Virginia Univ., Morgantown. Engineering Experiment Station.
For primary bibliographic entry see Field 8B.
W77-03294

THE RESPONSE OF NATURAL CHANNELS TO URBANIZATION: TWO CASE STUDIES FROM SOUTHEAST ENGLAND.
University Coll., London (England). Dept. of Geography.
G. E. Hollis, and J. K. Luckett.
Journal of Hydrology, Vol. 30, No. 4, p 351-363, 1976. 3 fig, 2 tab, 19 ref.

Descriptors: *Urban hydrology, *Urbanization, *Open channels, *Channel morphology, *Cross-sections, Hydraulics, Natural streams, Urban sociology, Foreign countries, Foreign research, On-site investigations.
Identifiers: *Urban channels, *England, *Channel enlargement.

The hypothesis that natural channels become enlarged as a result of an increase in flood flows following urbanization was tested in two areas of southeast England. The first study involved the use of a regression equation in urban basins to predict channel size prior to urbanization. The second study compared measurements made on the same channels in 1956 and 1970, a period during which the basin went from rural to 18% paved. Both studies showed increases in channel size, but this could not be confirmed by a difference of means test suited to paired observations. (Terstriep-ISWS)
W77-03314

THE IMPACT OF A FOREST FIRE ON A WILDERNESS LAKE IN NORTHEASTERN MINNESOTA.
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 5B.
W77-03375

4D. Watershed Protection

OPTRM - A HYDROLOGIC TRANSPORT MODEL WITH PARAMETER OPTIMIZATION.
Oak Ridge National Lab. Tenn.
For primary bibliographic entry see Field 5B.
W77-03115

THE UNIT HYDROGRAPH: A SATISFACTORY MODEL OF WATERSHED RESPONSE.
Massey Univ., Palmerston North (New Zealand). Dept. of Geography.
R. G. Heerdegen.
Water Resources Bulletin, Vol 10, No 6, Dec. 1974, p 1143-1161. 6 tab, 2 fig, 38 ref. OWRT B-041-PA(6), 14-31-0001-3635.

Descriptors: *Pennsylvania, *Unit hydrographs, *Precipitation(Atmospheric), Watersheds(Basins), Seasonal, Floods, *Model studies, *Lent squares method.
Identifiers: *Watershed parameters, *Climatic effects, *Flood events, Storm variables, Hydrologic regions, Seasonal differences.

Some 96 flood events larger than the mean annual flood from 16 watersheds in the Commonwealth of Pennsylvania were used to derive unit hydrographs by the least-squares method. Analyses of the unit hydrographs were conducted to ascertain their response to watershed parameters, climatic and storm variables and locations within different hydrologic regions. Significant differences both within and among watersheds led to the formulation and testing of hypotheses stating that differences among watersheds are caused by physiographic differences while differences within

watersheds result from climatic and storm differences. The analysis showed, that while many watersheds parameters strongly influence the shape of the unit hydrograph, only the storm variables duration and volume of precipitation excess produce significant differences. Seasonal differences were apparent but not proven statistically significant. (Sink-Penn State)
W77-03126

AFFORESTATION IN LOW RAINFALL AREAS.
Department of Forestry, Pretoria (South Africa).
P. J. Le Roux.
South African Forestry Journal, No. 93, p 1-6, June, 1975. 11 fig, 1 ref.

Descriptors: *Reforestation, *Forest management, *Erosion control, *Forestry, Rainfall, Precipitation(Atmospheric), Erosion, Terracing, Percolation, Forest soils, Forests, Soil moisture, Runoff, Infiltration, Vegetation establishment, Planting management.

Reforestation techniques in arid zones of Spain, Italy, Greece, and Israel were studied, and methods employed in soil preparation, the planting techniques, and the species planted are described. The main objectives of reforestation in Italy, Spain, and Greece are to prevent erosion, establish a green landscape, and form a layer of humus to assist in future reforestation. In low rainfall areas, the eradication of the natural vegetation, which will otherwise compete with the young trees, is considered of vital importance. The reforestation techniques of Israel are discussed separately. Large-scale reforestation has been undertaken in Israel during the past two decades in areas of low rainfall. In these areas, the growth of trees is affected mainly by soil moisture. To achieve the required results, various methods of soil preparation have been devised to improve infiltration of rainwater, to reduce runoff, and to reduce soil moisture losses through evaporation as well as losses due to transpiration of competing vegetation. The aims of the reforestation program in Israel are also presented. (Jamail-Arizona)
W77-03139

COMPUTER PROGRAMS FOR SEDIMENT TRANSPORT, DOCUMENTATION AND LISTING.
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2J.
W77-03298

LOW FLOW MODELING IN SMALL STEEP WATERSHEDS.
Utah Water Research Lab., Logan.
D. S. Bowles, and J. P. Riley.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12405, p 1225-1239, September 1976. 10 fig, 12 ref, 2 append.

Descriptors: *Groundwater, *Low flow, *Washington, Model studies, Computer models, Hydrology, Mathematical models, Mountain forests, Small watersheds, Streamflow, Flow.
Identifiers: *Simulation, *Soil water storage, Systems engineering, Mountain watersheds, Low streamflow.

On some small, steep mountain watersheds, the magnitude of low streamflow is almost uniform for prolonged periods. This phenomenon was exhibited by three small drainage areas within the Entiat Experimental Forest of central Washington State. On these watersheds, about two-thirds of the annual precipitation was in the form of snow. Annual hydrographs for each area were characterized by an almost uniform flow with a complex snowmelt hydrograph superimposed between March and August. The only distinct recession curve occurred at the end of the snowmelt season

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4D—Watershed Protection

and continued to decrease until a relatively uniform streamflow typified by the watershed was reached. In a computer simulation study of the three drainage areas, a linear groundwater reservoir submodel based on the recorded streamflow recession curves was found to be inadequate during low flow periods. Modifications of the subsurface part of the simulation model to improve the representation of the prolonged period of relatively uniform low flows were described in this paper. (Roberts-ISWS)
W77-03316

SILT REMOVAL FROM A LAKE BOTTOM,
Lake Herman Development Association, Inc.,
Madison, S. Dak.
For primary bibliographic entry see Field 5C.
W77-03392

HYDROLOGIC INVENTORY OF THE SAN RAFAEL STUDY UNIT.
Utah Div. of Water Resources, Salt Lake City.
For primary bibliographic entry see Field 4A.
W77-03552

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION. VOL. 17. INLAND FISHES OF THE LAKE MICHIGAN DRAINAGE BASIN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 6G.
W77-03566

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

RELATION BETWEEN ATMOSPHERIC POLLUTION, PRECIPITATION, AND STREAM-WATER QUALITY NEAR A LARGE URBAN-INDUSTRIAL COMPLEX,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5B.
W77-03097

PRECIPITATION CHEMISTRY STUDIES AT LAKE GEORGE: ACID RAINS,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
G. J. Stensland.
Rensselaer Fresh Water Institute at Lake George Newsletter, Vol. 6, No. 1, p. 1-3, February 1976. 1 fig, 2 tab.

Descriptors: *Chemistry of precipitation, *Precipitation(Atmospheric), *Acidic water, *New York, Acids, Air pollution, Pollutants, Sampling, Rainfall, Chemistry, Chemical analysis, Hydrogen ion concentration, Sulfates, Winds, Meteorology.
Identifiers: *Lake George(NY).

The mechanisms by which rains have become progressively more acidic over a period of years are not yet well understood. During the summer of 1975, a precipitation chemistry field study was conducted at the Fresh Water Institute facilities at Lake George. The major thrust of the effort was to collect sequential samples for each rain event. The ultimate goal was a clearer understanding of the scavenging processes leading to acid rains. For the 492 samples collected, the highest pH was 6.2, the lowest 3.1; the typical values were in the range of 3.2 to 4.5. The pH and the ion concentrations were extremely variable during single rain events. (Sims-ISWS)
W77-03098

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF TIN TRIBUTYLMETHACRYLATE IN WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
V. N. Tsai.
Gig Sanit 4, p. 42-45, 1975.

Descriptors: *Lethal limit, Public health, *Organic compounds, Toxicity, Rodents, *Pollutant identification, Organic wastes.
Identifiers: *Tin, *Methacrylates.

Tin tributylmethacrylate (TBTM) is highly toxic and has pronounced cumulative properties. Its threshold concentration in rats, judging by its organoleptic index of noxiousness, amounts to 0.064 mg/l, which corresponds to a level of 0.1 mg/l in water bodies. The nontoxic dose of ATTM in a chronic sanitary-toxicologic experiment was 0.00001 mg/kg, which is equivalent to a concentration of 0.0002 mg/l. This concentration is suggested as the maximum permissible one for the substance in water bodies.--Copyright 1976, Biological Abstracts, Inc.
W77-03107

DETERMINATION OF ARSENIC IN DRINKING WATER BY MEANS OF SILVER DIETHYLDITHIOCARBAMATE, (IN RUSSIAN),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
L. A. Khristianova, N. I. Udaltsova, and S. S. Soldatova.
Gig Sanit 1, p. 70-72, 1975.

Descriptors: *Arsenic compounds, *Potable water, *Pollutant identification, Carbanate pesticides, Public health, Organic compounds.
Identifiers: *Arsenic.

For a determination of As in drinking water, As is reduced to arsine and an absorbing solution of silver diethyldithiocarbamate in pyridine is used. The arsine stains the yellow solution of the reagent a violet color, allowing a visual determination of As.--Copyright 1976, Biological Abstracts, Inc.
W77-03113

FIELD MONITORING TECHNIQUES AND DATA ANALYSIS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
M. D. Sobsey.

Paper presented at Symposium on Virus Aspects of Applying Municipal Wastes to Land, June 28-29, 1976, Univ. of Florida, Gainesville. 10 p, 2 tab, 21 ref. OWRT A-090-NC(1), 14-34-0001-7070.

Descriptors: *Viruses, *Municipal wastes, *Monitoring, Land use, Soil properties, Vegetation, Statistical methods, Statistics, Geology, Hydrology, Water reuse.
Identifiers: *Land application, *Enteric viruses, Data analysis.

Field monitoring for enteric viruses should be planned and conducted on the basis of a rational virus monitoring program. A variety of site-specific factors, including (1) the type of waste; (2) the nature and extent of preapplication treatment; (3) the type of application system; (4) seasonal, climatic and meteorological conditions; (5) geology, hydrology and soil characteristics; (6) the type of vegetative cover and its intended use; and (7) the population and topology of the area should be considered in assessing the nature and extent of possible virus hazards that could be produced by the operation of the land application system. This assessment can be used to determine the type and size of virus samples and the sampling frequency and thereby provides the basis for the design and operation of a virus monitoring program. The data obtained from the virus monitoring program can

be analyzed using conventional statistical techniques but these analytical tools should be applied with caution because the conditions required for their use may not be consistent with the pattern of virus distribution and movement through the site, especially over a period of time. (Stewart-North Carolina State)
W77-03150

EXPERIMENTAL STUDIES ON THE SECOND INTERMEDIATE HOSTS OF CLONORCHIS SINENSIS: III. OBSERVATIONS ON THE RELATIONSHIP BETWEEN CLAVATE CELLS OF EPIDERMIS AND INFECTIVITY OF METACERCARIAE OF CLONORCHIS SINENSIS IN FRESHWATER FISH, (IN KOREAN),
For primary bibliographic entry see Field 5C.
W77-03161

THE RELATIONSHIP OF BOTTOM SEDIMENTS TO BACTERIAL WATER QUALITY IN A RECREATIONAL SWIMMING AREA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5B.
W77-03167

MACOMA BALTHICA: AN INDICATOR OF OIL POLLUTION,
Alaska Univ., College. Inst. of Marine Science.
D. G. Shaw, A. J. Paul, L. M. Cheek, and H. M. Feder.
Marine Pollution Bulletin, Vol 7, No 2, February 1976, p. 29-31, 2 tab, 4 ref.

Descriptors: *Oil, *Oil pollution, *Oil pollution effects, *Mortality, *Mollusks, *Benthic organism, Benthic animals, Oil spill, On-site investigations, Methodology, Bioassay, Sediments, *Alaska, *Bioindicators.
Identifiers: *Macoma balthica, *Bivalve molluscs, Indicator organisms.

The intertidal bivalve mollusc *Macoma balthica* shows potential as an indicator of oil pollution. In experiments designed to simulate stranding of an oil slick on a mudflat, a significant increase in mortality of this species was found to accompany increasing concentration of petroleum in sediment and increasing duration of exposure. (Katz)
W77-03185

MOLECULAR ACTIVATION ANALYSIS AND ITS APPLICATION TO METHYLMERCURY DETERMINATION IN VARIOUS MARINE SAMPLES,
Carleton Univ., Ottawa (Ontario). Dept. of Chemistry.
I. G. DeJong, and D. R. Wiles.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 6, p. 1324-1330, June, 1976. 4 tab., 17 ref.

Descriptors: *Analytical techniques, *Methodology, *Mercury, *Chemical analysis, *Pollutant identification, Laboratory tests, *Neutron activation analysis, Assay, Heavy metals.
Identifiers: *Nuclear activation analysis, *Methylmercury.

A novel method is described by which nuclear activation analysis can be used to determine the chemical form in which certain elements occur. The radiochemical retention of molecular identity is constant for a given type of sample and can be easily determined. Application of this method for quantitative estimation of methylmercury in fish protein concentrates and in blood is described in detail and the results discussed. The results are reliable and reproducible. Radiochemical retention depends on the species of fish, perhaps because of gamma radiolysis of the sample. An alternative method is also described which, although less

direct, is free from many of the common interferences, such as sodium and phosphorus. This method, also useful for blood analysis is appropriate for use at remote sampling stations. (Katz)
W77-03202

TRACE HYDROCARBON ANALYSIS IN PREVIOUSLY STUDIED MATRICES AND METHODS DEVELOPMENT FOR: (A) TRACE HYDROCARBON ANALYSIS IN SEA ICE AND AT THE SEA ICE-WATER INTERFACE, (B) ANALYSIS OF INDIVIDUAL HIGH MOLECULAR WEIGHT AROMATIC HYDROCARBONS, National Bureau of Standards, Washington, D. C. Trace Organic Analysis Group. S. N. Chesler, B. H. Gump, H. S. Hertz, and W. E. May.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 9. Chemistry and Microbiology, p 345-378, April 1976. 7 fig, 6 tab. Also as National Bureau of Standards Technical Note No. 889.

Descriptors: *Chemical analysis, *Aromatic compounds, Pollutants, *Water quality, Water pollution effects, *Baseline studies, *Quality control, Trace elements, Organic compounds, Pollutant identification.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, Petroleum resources.

With increasing petroleum development, serious consideration must be given to the presence of toxic polynuclear aromatic hydrocarbons arising from petroleum in the marine environment. In order to assess the biological effect of these molecules it is first necessary to develop chemical methodology for their analyses at very low levels (ng/kg). The liquid chromatographic (LC) technique described in this report permits ng/kg (ppt) analyses. Work is continuing on the development of an analytical method for the determination of petroleum hydrocarbons in various marine tissue samples. A small sediment intercalibration study was initiated. (Sinha-OEIS)
W77-03219

ENVIRONMENTAL ASSESSMENT OF ALASKAN WATERS - TRACE ELEMENT METHODOLOGY - INORGANIC ELEMENTS, National Bureau of Standards, Washington, D. C. P. LaFleur.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 9. Chemistry and Microbiology, p 379-442, April 1976. 4 fig, 1 tab, 196 ref.

Descriptors: *Alaska, *Chemical analysis, *Microorganisms, *Water quality, Pollutants, *Water pollution, *Baseline studies, *Environmental effects, Suspended solids, Bottom sediments, Data collection, *Trace elements, Organic compounds, Pollutant identification.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, Petroleum resources.

The research reported was designed to determine the content of selected trace metals in the water column, suspended particulate matter and bottom sediments. The report includes a survey of the available literature (including an evaluation for data on the concentration and distribution of selected trace elements). The progress reported is divided into three main areas: The results of the literature survey and the evaluation of this survey. Second, the collection and analyses of samples. This section also includes data obtained on sample containers and their cleaning. And finally, data on the possible determination of speciation in ocean water and sediments. (Sinha-OEIS)
W77-03220

BASILINE STUDY OF MICROBIAL ACTIVITY IN THE BEAUFORT SEA AND GULF OF ALASKA AND ANALYSIS OF CRUDE OIL DEGRADATION BY PSYCHROPHILIC BACTERIA, Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-03223

HISTORICAL AND STATISTICAL OCEANOGRAPHIC DATA ANALYSIS AND SHIP OF OPPORTUNITY PROGRAM, Alaska Univ., College. Inst. of Marine Science. R. D. Muench.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 359-425, April 1976. 41 fig, 2 tab, 16 ref, 2 append. 03-5-022-56.

Descriptors: *Alaska, *Ocean circulation, *Food chains, *Primary productivity, Fisheries, *Oil pollution, *Water pollution effects, *Resources development, *Baseline studies, *Environmental effects, Upwelling.

Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, Oil development, Oceanographic data, Cyclonic circulation.

Both historical and currently incoming ship-of-opportunity oceanographic data is utilized to examine large-scale circulation and mixing features on the southeastern Bering Sea shelf. Data obtained in the Unimak Pass-Bristol Bay region during summer 1968 were adequate to support existing hypotheses that a cyclonic circulation was occurring in that region. The data suggested in addition that upwelling of deeper water was occurring in central Bristol Bay. The hypothetical cyclonic circulation and attendant upwelling in central Bristol Bay could have significant implications. A contaminant released near or at the bottom could be carried upwards to the surface and incorporated into the food chain there at the primary productivity level. (Vertical mixing might also act to mix bottom contaminants to the surface.) Such biological contamination could result in concentration of undesirable substances at the higher food levels, for example, fish. This is particularly significant because Bristol Bay contains one of the World's major fisheries. (Sinha-OEIS)
W77-03237

ASPECTS OF THE CHEMICAL VARIABILITY OF SOME TASMANIAN INLAND WATERS (AUSTRALIA), Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2K.
W77-03283

A STUDY OF THE SUSPENDED PARTICULATE PROBLEM IN THE DUWAMISH BASIN, Boeing Co., Seattle, Wash. R. H. Olsen, M. Y. Almasy, and A. L. Wingert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 154, Price codes: A05 in paper copy, A01 in microfiche. Report EPA 910/9-75-010, May 1975. 81 p, 35 fig, 19 tab, 20 ref, 1 append. EPA 68-02-1499.

Descriptors: *Air pollution, *Surveys, *Washington, *Suspended solids, Dusts, Fly ash, Pollen, Pollutants, Path of pollutants, Winds, Industries, Industrial wastes, Chemical analysis, Particle size, Electron microscopy, Sampling, *Pollutant identification.
Identifiers: *Duwamish Basin(Wash), *Seattle(Wash).

Air quality data accumulated since 1965 indicate that the primary and secondary national air quality standards have been exceeded in the Duwamish Basin area of Seattle, Washington. The objectives

of this study were to determine the nature of suspended particulate and, subsequently, to quantify the impact of particulate sources. Ambient and source particulate was collected on fiberglass and membrane filters. Results from gravimetric, elemental, and compound analyses were combined with meteorological data for correlation and analysis. The contribution of sources for the basin was found to be 27% from natural sources, 39% transportation, and 34% point industry and multiple-area sources. Results from this study showed the complexity of suspended particulate. Source tests showed a multitude of elements and compounds present and, to complicate matters, that surrounding soil has been contaminated by industrial and area sources. About 35% of the particulate is directly related to road dust-type emissions. (Sims-ISWS)
W77-03291

BEAR RIVER EVALUATION REPORT, 1974 SURVEY, Environmental Protection Agency, Seattle, Wash. Region X; and Environmental Protection Agency, Seattle, Wash. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W77-03292

COMPUTER MAPPING OF WATER QUALITY IN SAGINAW BAY WITH LANDSAT DIGITAL DATA, Bendix Aerospace Systems Div., Ann Arbor, Mich. R. H. Rogers, N. J. Shah, J. B. McKeon, and V. E. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-16547, Price codes: A02 in paper copy, A01 in microfiche. Report BSR 4213, January 1976. 13 p, 4 fig, 2 tab, 7 ref. NASA NAS5-20942.

Descriptors: *Remote sensing, *Water quality, *Lake Huron, *Satellites(Artificial), *Michigan, Sampling, Surveys, Chemical properties, Biological properties, Chlorides, Conductivity, Nitrogen, Phosphorus, Chlorophyll, Temperature, Turbidity, Data processing, Regression analysis.
Identifiers: *LANDSAT, *Saginaw Bay(Mich).

Computer techniques were developed for mapping water quality parameters from LANDSAT data, using surface samples collected in an ongoing survey of water quality in Saginaw Bay (Lake Huron), Michigan, sponsored by the Environmental Protection Agency. Chemical and biological parameters were measured on 31 July 1975 at 16 bay stations in concert with the LANDSAT overflight. Application of stepwise linear regression to seven of these parameters and corresponding LANDSAT measurements resulted in regression correlation coefficients that varied from 0.94 for temperature to 0.71 for Secchi depth. Chloride, conductivity, total Kjeldahl nitrogen, total phosphorus, and chlorophyll were best correlated with the ratio of LANDSAT Band 4 to Band 5. Temperature and Secchi depth were best correlated to Band 5. Results of the regression analysis were used to map the water quality parameters over the entire bay. (Sims-ISWS)
W77-03305

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN SIMON AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA, AND IN HIDALGO COUNTY, NEW MEXICO--1975, Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03327

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN BERNARDINO VALLEY AREA COCHISE COUNTY, ARIZONA--1975, Geological Survey, Tucson, Ariz. Water Resources Div.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

For primary bibliographic entry see Field 7C.
W77-03328

GROUND-WATER QUALITY DATA FOR GEORGIA,
Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03333

BURIED AQUIFERS IN THE BROOKTON-BELGRADE AND LAKE EMILY AREAS, WEST-CENTRAL MINNESOTA—FACTORS RELATED TO DEVELOPING WATER FOR IRRIGATION,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-03335

APPRAISAL OF WATER RESOURCES IN THE HACKENSACK RIVER BASIN, NEW JERSEY,
Geological Survey, Trenton, N. J. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-03336

MEASUREMENT OF 'TURBIDITY' AND RELATED CHARACTERISTICS OF NATURAL WATERS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-03339

HYDROLOGIC STUDIES BY THE U.S. GEOLOGICAL SURVEY IN OIL-SHALE AREAS OF COLORADO, UTAH, AND WYOMING, 1976.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W77-03340

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, AUGUST 1968 - JANUARY 1975,
Geological Survey, Austin, Tex. Water Resources Div.
R. D. Reeves.
Report of Edwards Underground Water District, San Antonio, Texas, August 1976. 122 p, 3 fig, 2 tab, 17 ref.

Descriptors: *Water quality, *Groundwater, *Surface water, *Chemical analysis, *Water.
Identifiers: *San Antonio area(Tex), Edwards aquifer.

Water samples collected in the San Antonio, Tex., area, from 161 wells and 3 springs in the Edwards aquifer supply, Domestic water, Inorganic compounds, Bacteria, Trace elements, Heavy metals, Pesticides, Path of pollutants.
W77-03343

SUMMARY OF GEOLOGY AND GROUND-WATER RESOURCES OF PASSAIC COUNTY, NEW JERSEY,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-03345

GROUND-WATER RESOURCES OF GREELEY AND WICHITA COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans. Water Resources Div.; and Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.

W77-03347

SELECTED DATA ON WATER WELLS, GEOTHERMAL WELLS, AND OIL TESTS IN IMPERIAL VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03348

DATA ON SELECTED LAKES IN WASHINGTON, PART 5,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03350

WATER QUALITY SIMULATION OF TAHOE-TRUCKEE SYSTEM, NEVADA-CALIFORNIA - VOLUME II - APPENDICES,
Nevada Univ., Reno. Center for Water Resources Research.

J. A. Westphal, J. V. A. Sharp, and R. L. Bateman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 799, Price codes: A13 in paper copy, A01 in microfiche. Report EPA-600/2-76-005b, January, 1976. 296 p, 20 fig, 8 tab.

Descriptors: *Water quality, *Simulation analysis, *Model studies, *Rivers, *Tributaries, Surface waters, *California, *Nevada, Inorganic compounds, Bicarbonates, Chlorides, Sulfates, Sodium, Potassium, Calcium, Magnesium, Silica, Solid wastes, Computer models.
Identifiers: Tahoe-Truckee system(Calif-Nev).

Documentation for a digital inorganic water quality simulation model of the Tahoe-Truckee System which consists of the mainstem and tributaries of the Truckee River between Tahoe City, California and Nixon, Nevada is presented in the form of appendices. The model is based on the principle of mass-flux balance and presumes that inorganic constituents are conservative, complete mixing occurs instantaneously, and that flows are recapitulated accurately at the defunct gaging station near Truckee, California. The model was developed from 3 yr of water quality data collected monthly at about 40 sites along the mainstem and tributaries. The appendices include: predictive equations, a computer program for the model, cumulative frequency distribution curves, a derivation of complete mixing equations, and simulation model output for bicarbonate, chloride, sulfate, sodium, potassium, calcium, magnesium, silica, and total dissolved solids. (Kreager-FIRL)
W77-03351

PRELIMINARY ASSESSMENT OF SUSPECTED CARCINOGENS IN DRINKING WATER: REPORT TO CONGRESS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 961, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA 560/4-75-005, December, 1975. 115 p, 16 tab, 89 ref.

Descriptors: *Potable water, *Water pollution, *Public health, *Water pollution effects, *Pollutant identification, Water purification, Chlorination, Asbestos, Inorganic compounds, Organic compounds, Polychlorinated biphenyls, Polymers, Pesticides, Hydrocarbons, Economics, Water pollution control, Disinfection, Radioactivity.
Identifiers: *Carcinogens, Polyvinyl chloride, Chlorinated hydrocarbons, Trihalomethanes, Chloroform, Nitrosamines.

A compilation of efforts by the Environmental Protection Agency to identify and control

suspected carcinogens in drinking water is presented. Topics covered include: studies dealing with the nature and extent of drinking water, including analyses for polychlorinated biphenyls, polyvinyl chloride, nitrosamines, trihalomethanes, pesticides, suspected inorganic carcinogens, asbestos, and radioactivity; evaluations of the risks associated with contaminant levels in drinking water; the identification of drinking water contaminant sources (industrial sources, chlorination, municipal waste treatment discharges, agricultural chemicals); treatment techniques for controlling drinking water contaminants; and projected costs for removing carcinogenic contaminants from drinking water. Byproducts from chlorination (chloroform and other trihalomethanes) appear to be more easily prevented than removed. Two techniques currently being considered for avoiding trihalomethane formation are the use of an alternative to chlorine as the disinfectant and the removal of precursors that react with chlorine. (Kreager-FIRL)
W77-03360

WATER USAGE AND WASTEWATER CHARACTERIZATION AT A CROPS OF ENGINEERS RECREATION AREA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
N. R. Francigues, Jr. and A. J. Green, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A021 584, Price codes: A03 in paper copy, A01 in microfiche. Paper No. Y-76-1, January, 1976. 44 p, 7 fig, 10 tab, 5 ref.

Descriptors: *Recreation facilities, *Waste water(Pollution), *Water requirements, *Water utilization, *Water management(Applied), Ammonia, Nitrogen compounds, On-site investigations, Monitoring, Design criteria, *Pollutant identification.

A field monitoring study to collect information on water usage and waste water characterization at a Corps of Engineers recreation area was conducted in order to develop guidelines for assisting Corps of Engineers districts in optimizing the design and operation of recreation area waste water management systems. Water usage and waste water production rates were significantly less than those presently being used by Corps of Engineers districts. The characteristics of the waste water from the camping areas were not substantially different from those for picnic, rest, or other day-use areas (comparable to medium-strength domestic waste water), except for ammonia nitrogen which was somewhat higher. It appears that the sizing of water supplies and waste water treatment facilities should be based on the number of occupied campsites in overnight areas and not on the number of people. Suggested design values for waste water treatment facilities serving Corps of Engineers recreation areas are tabulated. (Kreager-FIRL)
W77-03362

A REVIEW OF CLUSTERING TECHNIQUES WITH EMPHASIS ON BENTHIC ECOLOGY,
Portland State Univ., Oreg. Urban Studies Center.
J. D. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 230, Price codes: A03 in paper copy, A01 in microfiche. Intern Report, EPA Pacific Northwest Environmental Research Laboratory, Newport, Oregon, August 1974. 21 p, 33 ref.

Descriptors: *Numerical analysis, *Benthos, Animal groupings, Plant groupings, Analytical techniques, Pollutant identification, Marine biology, Benthic fauna, Benthic flora.
Identifiers: *Clustering techniques.

The ability of clustering techniques to sort out benthic community types makes them useful for

detecting pollution stresses. This report reviews two hierarchical numerical clustering techniques in detail including benthic studies where these methods were employed, and briefly considers non-hierarchical strategies. The hierarchical strategies considered are agglomerative and divisive. Agglomerative hierarchies start with the individuals and fuse groups up to the entire population while divisive hierarchies start with the population and divide it down to the individuals. Agglomerative strategies seem to have more inherent problems than divisive, but are more popular in marine ecology. The main problems with agglomerative strategies are: (1) the computation time required for large populations, since the fusion process must run from the individual to the entire population, and (2) the tendency for minor misclassification because the fusion starts at the individual level where chance anomalies are more likely to occur. Most divisive strategies, though not as sensitive to these problems, are based on monothetic division which requires considerable insight in order to select the right attribute to divide the population into two groups as unlike as possible. Non-hierarchical strategies do not define a route between groups but optimize the structure of the group by making it as homogeneous as possible. However, their current state of development lags far behind that of hierarchical systems and they have received little interest in benthic studies. (Luedtke-Wisconsin)

W77-03372

DELAWARE 1975 STATE WATER QUALITY INVENTORY.

Department of Natural Resources and Environmental Control, Dover, Del. Div. of Environmental Control.

For primary bibliographic entry see Field 5G.
W77-03378

WATER POLLUTION SURVEILLANCE IN THE UNITED STATES. REPORT NUMBER 1, MISSOURI RIVER MAIN STEM, 1958-1962.

Public Health Service, Washington, D. C. Water Quality Section.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 546. Price codes: A05 in paper copy, A01 in microfiche. 1964. 99 p. 28 fig., 20 tab., 25 ref.

Descriptors: *Missouri River, *Water quality, Interstate rivers, River systems, River basins, River regulation, Monitoring, Data collections, On-site data collections, Water analysis, Sampling, Time series analysis, North Dakota, South Dakota, Nebraska, Kansas, Missouri, Physical properties, Chemical properties, Coliforms, Radioactivity, Organic matter, Plankton, Suspended solids.

Identifiers: Water quality surveillance, Williston(N Dak), Bismarck(N Dak), Yankton(S Dak), Omaha(Nebr), St. Joseph(Mo), Kansas City(Kan), St. Louis(Mo), Water quality criteria, Water quality parameters.

Although surveillance data from seven stations along the Missouri River from Williston, North Dakota to St. Louis, Missouri show that water quality criteria in the main stem tended toward poorer quality during the four years of the study, the waters are suitable—with treatment—for municipal and industrial use, and some of the negative criteria trends could be reversed with the construction of scheduled treatment facilities. Presently, however, recreational values in the lower segment of the main stem are severely limited because of municipal and industrial wastes. Testing stations other than Williston and St. Louis were Bismarck, N.D., Yankton, S.D., Omaha, Neb., St. Joseph, Mo., and Kansas City, Kans. A time series was prepared for each of 23 physical, chemical and biological water quality parameters at each station, and analogs were computer-plotted from magnetic tapes. Determinations of present levels, cyclic variations and trends were based on subjective curve-fitting and analysis.

Parameters included: temperature, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, chlorine demand, turbidity, color, pH, sodium, potassium, chloride, sulfate, alkalinity, hardness, total dissolved solids, longitudinal variations in major constituents, U.S. Geological Survey data, ammonia nitrogen, monor constituents, coliform bacteria, radioactivity, carbon adsorption, organic analyses and phytoplankton. (Harris-Wisconsin)

W77-03379

VIRUS AND BACTERIAL REMOVAL FROM WASTE WATER BY LAND TREATMENT, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

For primary bibliographic entry see Field 5D.
W77-03447

MUSSEL TEST FOR BIOLOGICAL CONTROL OF WATER POLLUTION (KAGYLO-TESZT VIZSZENNYEZESÉK BIOLOGIAI HATÁSÁNAK VIZSGALATÁRA), J. Salanki.

Hidrologiai Kozl. Vol. 56, No. 6, p 281-282, June, 1976. 3 fig, 5 ref.

Descriptors: *Mussels, *Bioindicators, *Monitoring, *Water pollution, Freshwater fish, Heavy metals, Oxygen, Pollutant identification.

The use of the fresh water mussel (*Anodonta cygnea*) as a biological indicator of water pollution is proposed. The fresh water mussel is a typical filter-feeding animal and reacts to various substances dissolved in the water by changes in the rhythmic and periodic activity of its adductor muscles. This activity can be monitored by recording the position and movement of the animal's shells which in turn reflect the concentration of pollutants like heavy metals as well as the oxygen level of the water. (Kreager-FIRL)

W77-03454

GROUNDWATER QUALITY ADJACENT TO A SEPTIC TANK SYSTEM, ADI, Ltd., Fredericton (New Brunswick).

For primary bibliographic entry see Field 5D.
W77-03456

THE ELECTROLYTIC RESPIROMETER - I. FACTORS AFFECTING OXYGEN UPTAKE MEASUREMENTS,

Iowa State Univ., Ames. Dept. of Civil Engineering. J. C. Young, and E. R. Baumann. Water Research, Vol. 10, No. 11, p 1031-1040, 1976. 11 fig, 1 tab, 10 ref.

Descriptors: *Biochemical oxygen demand, *Measurement, *Pollutant identification, *Electrolysis, Oxygen requirements, Equipment, Pressure, Mixing.

Identifiers: *Respirometers, *Oxygen uptake.

A more complete and accurate measurement of the biochemical oxygen demand (BOD) of waste waters can be provided by the electrolytic respirometer. The apparatus has three major parts: a reaction vessel containing the sample and a magnetic stirring bar or other mixing device; an adaptor unit or alkali container with potassium hydroxide or another solution which absorbs metabolically produced carbon dioxide from atmosphere above sample; and a manometer cell containing a weak electrolyte (sulfuric acid or sodium hydroxide) which detects pressure changes and acts as an oxygen generator to maintain a constant partial pressure in the atmosphere of the sample container. The system is simple and provides a continuous oxygen uptake readout. Errors in measurement are usually contributed to the mixing rate and the concentration of oxygen demanding organic material in the sample. Increased mixing or oxygen

enrichment of the air contacting the sample can overcome oxygen transfer limitations. Control of barometric pressure in the manometer cell is important since changes will alter oxygen readings. Corrections with this system are easily made. The coefficient of variability was less than 3.5% for samples with an ultimate BOD value between 20 and 500 mg/liter. BOD measurement is more precise with the electrolytic respirometer than with the dilution method. (Collins-FIRL)

W77-03457

MODEL STUDIES IN AQUEOUS CHLORINATION: THE CHLORINATION OF PHENOLS IN DILUTE AQUEOUS SOLUTIONS,

Waterloo Univ. (Ontario). Dept. of Chemistry. J. G. Smith, S. F. Lee, and A. Netzer. Water Research, Vol 10, No 11, p 985-990, 1976. 2 fig, 1 tab, 25 ref.

Descriptors: *Chlorination, *Phenols, *Municipal wastes, Water pollution effects, Waste water treatment, Solvent extractions, Chromatography, Water analysis.

Identifiers: Aqueous chlorination.

To further elucidate well known reactions of phenol which, when present as a contaminant of water supplies, can lead to unpleasant taste and odor in the chlorine-treated end product, model studies were performed to determine the end products of chlorination of phenols in aqueous solutions. Phenols tested were 2,4,6-trichlorophenol; 2,3,4,6-tetrachlorophenol; pentachlorophenol; and p-nitrophenol. These were examined at initial pH's of 6.0 and 3.5, the reaction products isolated by solvent extraction, the mixtures separated by column chromatography and the products identified by their spectral properties. It was found that chlorine displaced the nitro group and there was an aromatic substitution to a more highly chlorinated phenol. Phenol was also oxidized to a chlorinated benzoquinone. There was the addition of one mole of chlorine to the phenol to form chlorinated 2,5-cyclohexadienones and the addition of two moles of chlorine or hypochlorous acid to form chlorinated cyclohexenones and/or chlorinated hydroxycyclohexenones. Minor amounts of octachlorocyclohexadiene (from tetra- and pentachloro-phenols) and octachlorodibenzodioxin (from pentachlorophenol) were isolated. It was concluded that chlorination of phenols in dilute aqueous solution can produce highly chlorinated non-phenolic products. (Collins-FIRL)

W77-03458

EFFECT OF WATER CHLORINATION UPON LEVELS OF SOME POLYNUCLEAR AROMATIC HYDROCARBONS IN WATER,

Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering. For primary bibliographic entry see Field 5F.
W77-03459

CYANOPHAGE ANALYSIS AS A BIOLOGICAL POLLUTION INDICATOR-BACTERIAL AND VIRAL,

North Carolina Univ. at Greensboro. Dept. of Biology. C. T. Smedberg, and R. E. Cannon. Journal Water Pollution Control Federation, Vol 48, No 10, p 2416-2426, October, 1976. 4 fig, 4 tab, 26 ref.

Descriptors: *Analytical techniques, *Viruses, *Coliforms, *Monitoring, *Sewage treatment, Measurement, Indicators, On-site investigations, Waste water treatment, Performance, Biological treatment, Trickling filters, Chlorination, Screens, Feasibility studies.

The use of the non-pathogenic, blue-green algal virus LPP-1 as an indicator of virus and coliform presence in waste water was investigated during

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

field studies at a sewage treatment plant. This cyanophage attacks the filamentous, non-blooming blue-green algal genera *Lyngbya*, *Phormidium*, and *Plectonema* and can be used as an inexpensive monitor of virus and coliform removal from waste water. Its natural presence in waste water and its resistance to chlorination make it especially attractive as an indicator of animal viruses. Since the presence of cyanophages in waste water is paralleled by coliform presence, LPP-1 can also be used to detect fecal pollution. Results obtained with this monitoring test are tabulated for composite samples of waste water taken at initial screening points, before and after trickling filtration, and after chlorination. (Kreager-FIRL) W77-03460

USE OF INTRINSICALLY SAFE INSTRUMENTATION.
Water Services, Vol. 80, No. 964, p 356-357, June, 1976. 2 ref.

Descriptors: *Monitoring, *Analytical techniques, *Sewage treatment, *Explosions, *Gases, Electrical equipment, Design criteria, Safety, Treatment facilities.

Safeguards to prevent flammable gas explosions triggered off by electrically-operated monitoring equipment used within sewage collection networks and at sewage treatment plants are discussed. Monitoring and control equipment is frequently made intrinsically safe by the use of shunt diode barriers which effectively remove the risk of incendive levels of energy breaking through from remotely mounted equipment. The majority of shunt diode barrier applications in the sewage industry are straightforward and include the use of switches, thermocouples, resistance elements, thermometers, and solenoid pilot valves in pneumatic systems. Magnetic flowmeters are made safe by encapsulating the coil and increasing the safety terminal compartment. The probes and detecting circuit are normally made safe by the use of shunt diode safety barriers. (Kreager-FIRL) W77-03462

MONITORING OF COMMUNITY WATER SUPPLIES.
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
P. D. Foley, and G. A. Missingham.
American Water Works Association Journal, Vol. 68, No. 2, p 105-111, 6 tab, 11 ref, 1 append.

Descriptors: *Monitoring, *Water supply, *Water quality, Gas chromatography, Mass spectroscopy, Heavy metals, Organic compounds, Potable water, Analytical techniques, Public health, Electron microscopy, *Pollutant identification, *Canada.
Identifiers: *Ontario.

Water quality in Ontario, Canada, was subjected to an in depth monitoring program. New and improved analytical techniques such as the electron microscope and gas chromatograph-mass spectrometer-computer analysis were used to confirm the presence of various substances at low concentrations in water supplies. Great concern was shown towards substances known to be toxic at great concentrations or carcinogenic. Substances investigated were asbestos, heavy metals, and organics. Resultant analyses indicated that the asbestos in water does not penetrate the gut wall and is not a health hazard. Heavy metals were not seen as a major problem. Their problems consist of particles from lead services or copper piping in the distribution system. High copper levels are controlled by raising the water pH, which lessens the lead problem, though that may require replacement of lead. Organic analysis revealed a great low-level incidence of haloforms. In drinking water, the only organic with an assessable history was found to be chloroform. It was not considered a health hazard. Pesticide and herbicide levels

were not considered dangerous. It was finally concluded that the great differences in the orders-of-magnitude in doses and concentrations prevent any definite conclusions. (Collins-FIRL) W77-03463

INVESTIGATIONS ON THE IMPORTANCE OF THE ORGANIC CHLORO-COMPOUNDS AND THEIR ADSORBABILITY
(UNTERSUCHUNGEN ZUR BEDEUTUNG DER ORGANISCHEN CHLORVERBINDUNGEN UND IHRER ADSORBIERBARKEIT),
W. Kuehn, and F. Fuchs.
Vom Wasser, Vol. 45, p 217-232, 1975. 8 tab, 25 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Treatment facilities, *Organic compounds, *Chlorine, Adsorption, *Water treatment, Chlorination, Dewatering, Incineration, Activated carbon.
Identifiers: Pyrohydrolysis.

Pyrohydrolysis, used to analytically determine organic chloro-compounds, also shows interesting results for controlling water treatment plants for the concentration in water of these compounds. Results for DMF-extract, dioxane extract, non-polar organic chlorine and total organic chlorine in activated carbon samples from water works are given. Values for Lake Constance, the Rhine, and several other rivers were measured, and these substances' origins are discussed. More highly activated carbon is more selective for organic chlorine than lower activated carbon. (Snyder-FIRL) W77-03465

A NEW METHOD OF AUTOMATIC DETERMINATION OF NITRATE IN WASTE WATERS AND POLLUTED SURFACE WATERS (EIN NEUES VERFAHREN ZUR AUTOMATISCHEN NITRAT-BESTIMMUNG IN ABWASSERN UND BELASTETEN OBERFLAECHEWASSERN),
R. Wagner, I. Frommert, and R. Koenig.
Vom Wasser, Vol. 45, p 271-284, 1975. 9 fig, 18 ref.

Descriptors: Surface waters, *Pollutant identification, *Sewage, *Analytical techniques, *Automation, *Nitrates, Waste water (Pollution), Effluents, Ions, Water pollution, Instrumentation.
Identifiers: Receiving streams, P-fluoro phenol method.

For manual nitrate determination in sewage, plant effluents, and receiving streams, the p-fluoro phenol method is very successful. Nitrate ions form 2-nitro-4-fluoro phenol in a nitration step included in the method. The 2-nitro-4-fluorophenol is transferred to an alkaline recipient by steam distillation, producing a yellow solution for spectrophotometric measurement. An AutoAnalyzer system, including distillation with a new pass through unit to heat the sample stream, based on a boiling thermostat, which is located in front of the distillation head, was prepared for automatic performance of the p-fluoro phenol method. The manifold is adapted for between about 0.1 and 30 ppm nitrate nitrogen; the sample frequency is 10 per hour. This automatic method may also be used in cases in which methods based on partial nitrate ion reduction to nitrite ions, due to irregular reduction rates, do not give reliable results. (Snyder-FIRL) W77-03466

ULTRAVIOLET PURIFICATION SYSTEM.
Mechanical Engineering, Vol. 98, No. 6, p 51, August, 1976.

Descriptors: *Monitoring, *Ultraviolet radiation, Potable water, Sewage treatment, Water treatment, Waste water treatment, Economics, Disinfection, Bacteria, Viruses, *Pollutant identification.

An automatic, self-monitoring system using ultraviolet radiation was developed to provide a continuous flow of bacteria-free process, product, or drinking water. Its capacity ranges from 6 to 100,000 gallons per minute. Sewage effluent is disinfected and all bacteria and viruses are destroyed without harmful chemical by-products. Color, taste, and pH are not changed. Components are a stainless steel purification chamber with high-intensity ultraviolet lamps, remotely housed electrical components and controls, a water quality monitor, and in-place cleaning capability. Operations are continuously monitored and any discrepancy is immediately indicated. It has proved to be an economical treatment process. (Collins-FIRL) W77-03467

NITRATE MONITORING.
Water Services, Vol. 80, No. 964, p 357-358, June, 1976. 1 fig.

Descriptors: *Nitrogen, *Waste water treatment, *Sewage treatment, *Pollutant identification, *Analytical techniques, *Treatment facilities, *Nitrates, Monitoring, Sewerage, Potable water, Water quality standards.

The World Health Organization has fixed a limit for nitrate in potable water of 11.3 mg/liter nitrate as nitrogen. One major source of nitrate is sewage effluent, since nitrates are derived from ammonium compounds during secondary treatment in normal aeration plants and conventional sewage treatment has little effect on nitrate levels. Ion-selective electrode analysis for nitrate measurement has a wide range of applications and is comparatively unaffected by strong or highly colored solutions and suspended solids but requires frequent standardization and constant temperature control or compensation. Continuous monitoring is essential to prevent undetected gross pollution, and a suitable continuous monitor designed for on-line analysis has been developed. Measurement is made by a preset expanded scale pH amplifier. The sample is drawn from a constant head unit, through a heat exchanger and then pumped past a mixing cell fitted with the nitrate and reference electrodes. The first major use of this monitor for nitrate was northeast of London on the River Lee, which carries a high sewage effluent loading. The River Lee is also monitored for pH, temperature, dissolved oxygen, conductivity, suspended solids, and ammonia. Nitrate monitoring was added to the network in 1973. Nitrate has been shown to be useful for assessing pollution loading and denitrification. (Snyder-FIRL) W77-03468

MICROBIOLOGICAL EXAMINATION OF WATERS AND EFFLUENTS.
Canada Centre for Inland Waters, Burlington (Ontario).
B. J. Dutka.
ASTM Standardization News, Vol. 4, No. 1, p 19-21, January, 1976. 1 tab.

Descriptors: Water quality, *Standards, *Water analysis, Bacteria, Microorganisms, Bioassay, *Pollutant identification, *Water quality standards, Microbiology.

Some form of standardized water quality estimation procedures is needed to rectify the present situation in which analysts use many individually favored methods. Because of the many uses of bacteria as a tool in assessing water and effluents, standardization is necessary for meaningful data. Bacteriologists and microbiologists were consulted on a world-wide basis for input into the development of international standard procedures. Also an ASTM committee was charged with developing such procedures. One major concern is media formulation. The goals of this group are to define organism under study, to develop a simple biochemical definition of the organism, and to prepare isolation and enumeration procedures applicable to a variety of samples. (Collins-FIRL)

W77-03470

THE AERIAL PHOTO-WATER QUALITY LINK.

Environmental Science and Technology, Vol. 10, No. 3, p 228-229, March, 1976.

Descriptors: *Eutrophication, *Lakes, *Analytical techniques, *Aerial photography, Color, Algae, *Pollutant identification, *Remote sensing.

A new technique of analyzing aerial photography was applied to the study of eutrophication in lakes. The progression of eutrophication in lakes is accompanied by a change in water color from blue to green. The higher the concentration of algae, the greener the water color. One problem involved was whether satellite or aircraft should be used in the photography. Aerial photography has the advantage of being able to sample an entire lake in minutes or hours, rather than in days as with surface craft. New processing procedures allow sophisticated color separation which can be analyzed to determine areas where eutrophication is either beginning or increasing. Corrections may be made for atmospheric conditions which might interfere with photo interpretation. This process is being improved and can provide immense detailed information to scientists who must deal with this problem. (Collins-FIRL)
W77-03471

THE LIMITATION OF THE RATIO OF FECAL COLIFORMS TO TOTAL COLIPHAGE AS A WATER POLLUTION INDEX.

Department of Agriculture, Lethbridge (Alberta). R. G. Bell. Water Research, Vol. 10, No. 8, p 745-748, 1976. 1 fig, 2 tab, 11 ref.

Descriptors: *Pollutant identification, *Waste water treatment, *Sewage treatment, *Sewerage, *Analytical techniques, Treatment facilities, E coli, *Bacteriophage. Identifiers: *Coliphage.

A study was undertaken to determine whether the ratio of fecal coliform bacteria to total coliphage in raw sewage, sewage lagoon effluent, or river water, had any significance as a pollution index. Fecal coliform populations were determined using the most probable number technique. Total coliphage populations were determined using Escherichia coli B host cells. The ratios of fecal coliforms to coliphage were 87:1, 4.2:1, and 0.15:1, respectively. The ratio of fecal coliforms to coliphage in stored raw sewage decreased to about 1:1 within 7 days at 20°C and within 28 days at 4°C. The changes resulted from the greater longevity of the coliphage. The ratio of fecal coliforms to coliphage is not considered a reliable index of fecal pollution because it is influenced by prior contamination, presence of sediment, chlorination, and temperature. (Snyder-FIRL)
W77-03472

EFFECT OF VARIABLE LOADING ON OXYGEN UPTAKE.

Iowa State Univ., Ames, Dept. of Civil Engineering. For primary bibliographic entry see Field 5D.
W77-03473

RAPID DETECTION OF BACTERIAL ENDOTOXINS IN DRINKING WATER AND RENOVATED WASTE WATER.

Texas Univ. Health Science Center at San Antonio, Dept. of Pathology. J. H. Jorgensen, J. C. Lee, and H. R. Pahren. Applied and Environmental Microbiology, Vol. 32, No. 3, p 347-351, September, 1976. 2 tab, 17 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Toxins, *Pathogenic bacteria, *Potable water, *Reclaimed water, Waste water(Pollution), Tertiary treatment. Identifiers: *Endotoxins, *Limulus assay.

Experiments were conducted to determine the applicability of using the Limulus assay to measure endotoxins in potable waters and highly treated waste waters. Twenty-five samples of drinking water and Advanced Waste Treatment (AWT) process samples from around the United States were tested. The Limulus test was easily adapted to water testing without modification of the assay procedure. This investigation showed that this method could be used to test water samples for pyrogenic substances, i.e., gram-negative bacterial endotoxins. It was proven simple, relatively inexpensive, sensitive, and reliable. Other advantages determined were rapidity (total test time of less than 2 hr), no need for specialized equipment or facilities for maintaining lab animals, and it can be performed with little difficulty in any microbiology laboratory after short specialized instruction. (Collins-FIRL)
W77-03474

TRANSFERABLE DRUG RESISTANCE ASSOCIATED WITH COLIFORMS ISOLATED FROM HOSPITAL AND DOMESTIC SEWAGE.

Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences. T. D. Fontaine, III, and A. W. Hoadley. Health Laboratory Science, Vol. 13, No. 4, p 238-245, October, 1976. 1 fig, 4 tab, 20 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Pollutant identification, Treatment facilities, Resistance, Coliforms, Hospitals. Identifiers: Drug resistance, Hospital wastes.

A study was performed to determine the extent to which hospital wastes may serve as reservoirs for the spread of antibiotic-resistant fecal coliforms and their associated risk transfer factors in the environment. Samples of hospital, campus, and combined waste streams entering the University of Florida treatment plant were collected, as well as samples of treated effluent before chlorination and polishing pond effluent. Of 41 bacterial strains isolated from hospital wastes, 90.2% were resistant to at least one antibiotic, in contrast to 55.5% of 54 isolates from campus wastes. The proportion of resistant strains able to transfer resistance varied from 50% to 90%, depending on season and source. Transfer of as many as seven resistance determinants was demonstrated under the usual laboratory conditions. Populations of fecal coliforms were reduced by slightly more than 90% by treatment prior to chlorination, but the proportions of isolates resistant to one or more antibiotics and able to transfer resistance did not change appreciably. The proportion of multiple resistant strains isolated from hospital wastes was twice that observed in campus wastes, and remained approximately constant through the treatment plant. The emergence of a population of Salmonella choleraesuis resistant to tetracycline in a laboratory of simulation of waste treatment processes provided preliminary evidence that resistance transfer may occur in sewage. (Collins-FIRL)
W77-03475

AEROSOL PRODUCTION BY IRRIGATION EQUIPMENT USED FOR LAND APPLICATION OF WASTE WATER.

Brookhaven National Lab., Upton, N. Y. G. S. Raynor, and J. V. Hayes. American Industrial Hygiene Association Journal, Vol. 37, No. 9, p 526-536, September, 1976. 9 fig, 4 tab, 8 ref.

Descriptors: *Pollutant identification, *Sewerage, *Aerosols, *Irrigation practices, *Irrigation

systems, Application equipment, Land use, Waste water(Pollution), Water reuse.

Experiments were conducted to determine the size distribution and concentration of aerosols and drops from dilute untreated sewage sprayed through agricultural irrigation systems. Experiments were conducted at specified pressures for each nozzle system over a wide range of wind speed, temperature, and relative humidity. Output rate, flow rate through each sampler and meteorological conditions were measured during testing. Testing was done with four nozzle systems used for upland recharge of waste water. A small part of the liquid output was lost to drift droplets, but large quantities of small aerosols were produced, especially in the respirable size range. The typical system produced from 10 to the 13th power to 10 to the 14th power particles per spray acre with a rate of 50,000 gallons per acre per day. Fewer aerosols were produced at low wind speeds from low spraying nozzles. A shorter operating time and exposure to wind may result in fewer aerosols at greater flow rates if fixed amounts of liquids must be emitted. Under typical atmospheric conditions, centerline concentrations decrease from one to two orders of magnitude in a travel distance of 1 km near ground level. (Collins-FIRL)
W77-03484

RISK OF COMMUNICABLE DISEASE INFECTION ASSOCIATED WITH WASTE WATER IRRIGATION IN AGRICULTURAL SETTLEMENTS.

Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab. For primary bibliographic entry see Field 5C.
W77-03485

IDAHO ENVIRONMENTAL OVERVIEW.

Consulting Engineers, Inc., Boise, Idaho. For primary bibliographic entry see Field 6G.
W77-03557

DETERMINATION OF MAXIMUM PERMISSIBLE LEVELS OF SELECTED CHEMICALS THAT EXERT TOXIC EFFECTS ON PLANTS OF ECONOMIC IMPORTANCE IN ILLINOIS.

Southern Illinois Univ., Carbondale. J. H. Yopp, W. E. Schmid, and R. W. Holst. Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 654. Price codes: A12 in paper copy, A01 in microfiche. Illinois Institute for Environmental Quality, Chicago, Report No 74-33, August 1974. 272 p, 27 tab, 525 ref.

Descriptors: *Phytotoxicity, *Chemicals, *Trace elements, *Air pollution effects, *Agronomic crops, *Horticultural crops, *Vegetable crops, *Soil contamination effects, *Illinois, Standards, Aluminum, Cadmium, Chlorine, Chromium, Copper, Fluorine, Lead, Manganese, Mercury, Molybdenum, Nickel, Nitrogen compounds, Nitrates, Ozone, Sodium, Sulfur, Resistance, Public health, Sulfates, Sulfides, Zinc, Forests, Water quality standards. Identifiers: Barium, Beryllium, Boron, Ethylene, Bromide, Nitrogen dioxide, Peroxyacetyl nitrate, Selenium, Sulfur dioxide, Hydrogen sulfide, Thallium, Vanadium.

Based on comprehensive literature surveys, maximum permissible levels are proposed for aluminum, barium, beryllium, boron, bromide, cadmium, carbon-ethylene, chlorine, chromium, copper, fluorine, lead, manganese, mercury, molybdenum, nickel, nitrogen dioxide, peroxyacetyl nitrate, ammonia, nitrate, ozone, selenium, sodium, sulfur dioxide, sulfate, hydrogen sulfide, thallium, vanadium, and zinc in Illinois soils and air to avoid phytotoxicity of agronomic, horticultural, and vegetable crops, and conifers. The phytotoxic levels were generally selected on the basis of the most sensitive species, but the

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

response of each plant varied with environmental factors, genotype, variety of the same species, growth stage, and nutritional status. Data of the degree of sensitivity (or tolerance) of economically important plants allows selection of species for culture which are adapted to the Illinois environmental and economic conditions. The symptomatology of the various trace metals and oxides is discussed for specific plant types, as are the sources of the chemicals, and the biochemical responses. The absence of controlled studies on uptake of airborne particulates of these trace metals prevented any recommendations concerning permissible levels of these agents as air pollutants. The phytotoxicity of each element is discussed in a separate chapter, with tables ranking plants according to their economic importance and sensitivity. The maximum permissible levels are given for both airborne and soil forms of each element. (Auen-Wisconsin)
W77-03565

NATURE PRESERVATION ACTIVITY RR INVESTIGATION: PART 6. A MODIFIED METHOD OF MEASURING THE CHEMICAL OXYGEN DEMAND GIVES A HIGH ANALYTICAL CAPACITY, (IN SWEDISH), Uppsala Kommun Naturvårdsverket RR-Under-sökning (Sweden). Algstab. Fysiol. Bot. A. Forsberg, and S.-O. Ryding.
Vatten 31(2), p 148-154, 1975.

Descriptors: *Sampling, *Water analysis, *Methodology, *Water treatment, *Water purification, Autoclaves, Oxidation, Mercury, Chlorine, Potassium, Manganese, Ions, Pollutant identification.
Identifiers: Recipient examination, Reagent volume, Dichromate concentration.

For a water control program based on frequent sampling, a simplified chemical O₂ demand (COD) measurement method, the purification plant recipient examination (RR) method, was developed. The procedure includes small sample and reagent volume, rapid addition of a mixture of all reagents to the sample, exclusion of Hg, and autoclaving at 120°C for 1 h. The yield by the RR-method was about 10% lower than that by the standard method, mostly due to decreased dichromate concentration and oxidation temperature. Correction for Cl⁻ interference is unnecessary below 1 g Cl⁻/l; Hg addition has a significant influence on the results only in water samples with a higher Cl⁻ concentration. The RR-method showed a good correlation to the values for KMnO₄ consumption. A large number of water samples can be preserved by deep-freezing and analyzed quickly later on.
W77-03589

WATER QUALITY, PLANKTON AND EUTROPHICATION OF BERGSVATNET, EIKEREN AND FISKUMVATNET, S. NORWAY, (IN NORWEGIAN), Norsk Institutt for Vannforskning, Blindern. For primary bibliographic entry see Field 5C.
W77-03595

5B. Sources Of Pollution

DISTRIBUTION OF PELAGIC ZOOPLANKTON WITHIN A THERMAL GRADIENT IN LAKE COLUMBIA, A COOLING LAKE NEAR PORTAGE, WISCONSIN, Wisconsin Univ., Madison. Lab. of Limnology. For primary bibliographic entry see Field 5C.
W77-03077

DISTRIBUTION AND FEEDING OF PUMPKIN-SEED (LEPOMIS GIBBOSUS) AND BLACK CRAPPIE (POMOXIS NIGROMACULATUS) IN A POWER PLANT COOLING LAKE, Wisconsin Univ., Madison. Lab. of Limnology. For primary bibliographic entry see Field 5C.

W77-03078

SURF-ZONE WATER QUALITY IN LIVERPOOL BAY, Lancaster Univ., Bailrigg (England). Lancashire and Western Sea Fisheries Joint Committee. P. R. Hinchcliffe.
Estuarine and Coastal Marine Science, Vol. 4, No. 4, p 427-442, July 1976. 9 fig, 1 tab, 21 ref.

Descriptors: *Water quality, *Surf, *Bays, *Nutrients, *Eutrophication, Coasts, Shores, Estuaries, Phosphorus, Phosphates, Nitrogen compounds, Nitrites, Nitrates, Ammonia, Salinity, Coliforms, Hydrogen ion concentration, Suspended solids, Seasonal, Monthly, Foreign countries.
Identifiers: *Liverpool Bay, *Surf-zone, *Lancashire, *Mersey River.

Results of a continuing investigation of seasonal and long-term changes in surf zone water quality in Liverpool Bay were reported for the period 1971-1974. A total of thirteen sites was sampled at monthly intervals for all or part of that period. Of the sample constituents analyzed, salinity, pH, ammonia, and nitrite-nitrate demonstrated fairly predictable seasonal patterns. Dissolved oxygen remained near saturation level throughout. Dissolved reactive phosphate was buffered by large amounts of suspended matter and showed little seasonal variation. Coliform levels were higher in winter than summer, suggesting that increasing temperature produces higher die-off rates. The Mersey appeared to exert strong influence on the salinity and the concentrations of inorganic nitrogen and phosphorus on Liverpool Bay. Both phosphate and nitrate showed significant tendencies to increase over the four-year period. If these increases continue, excessive eutrophication of the bay seems probable in the near future. Monthly sampling at five Lancashire coastal sites is intended to continue indefinitely. (Bender-ISWS)
W77-03092

COASTAL REGION RESIDENCE TIME ESTIMATES FROM CONCENTRATION GRADIENTS, Ontario Ministry of the Environment, Toronto. For primary bibliographic entry see Field 5C.
W77-03093

RELATION BETWEEN ATMOSPHERIC POLLUTION, PRECIPITATION, AND STREAM-WATER QUALITY NEAR A LARGE URBAN-INDUSTRIAL COMPLEX, Illinois State Water Survey, Urbana. F. A. Huff.
Water Research, Vol. 10, No. 11, p 945-953, 1976. 3 fig, 7 tab, 12 ref. NSF GK-38329.

Descriptors: *Pollution, *Streamflow, *Urban runoff, *Missouri, *Air pollution, Water pollution, Chemicals, Chemical analysis, Sampling, Rainfall, *Precipitation (Atmospheric), Runoff, Fallout, Correlation analysis, Pollutants, Path of pollutants.
Identifiers: *St. Louis (Mo).

An investigation was made of the effects of atmospheric effluents from a large urban-industrial area (St. Louis) on the water quality in two small basins that are frequently downwind of the city. Analyses were made of the relative magnitude of the atmospheric contribution to streamwater pollution and how this contribution is related to weather conditions. Field sampling was done during a 15-month period, and investigation was made of atmospheric-streamwater relationships for storm, seasonal, and annual periods. Computations were made for 12 chemical constituents in the rainwater and streamwater. Results indicated that only minor changes usually occur in streamwater pollutant concentrations during and shortly

following storms. Also, no strong relationship exists between streamwater concentration and weather conditions. For most pollutants, the atmospheric deposition was small compared with the annual stream load because of major surface sources. However, evidence was also found that urban-industrial sources can occasionally be important contributors to stream contamination. (Sims-ISWS)
W77-03097

PRECIPITATION CHEMISTRY STUDIES AT LAKE GEORGE: ACID RAINS, Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering. For primary bibliographic entry see Field 5A.
W77-03098

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY, PROGRESS REPORT, Allen County Soil and Water Conservation District, Fort Wayne, Ind. For primary bibliographic entry see Field 5G.
W77-03106

OPTRM - A HYDROLOGIC TRANSPORT MODEL WITH PARAMETER OPTIMIZATION, Oak Ridge National Lab. Tenn. D. E. Fields, and S. B. Watson. Report ORNL-NSF-EATC-14, September 1975. 131 p, 8 fig, 5 tab, 28 ref, 9 append. NSF W-7405-eng-26.

Descriptors: *Model studies, *Runoff, *Watersheds (Basins), *Path of pollutants, Computer models, Mathematical models, Computer programs, Tracers, *Optimization, Streamflow, Hydrologic systems, Water transfer, Water pollution, Hydrology.
Identifiers: *Hydrologic transport models.

A version of the Wisconsin Hydrologic Transport Model which incorporates a procedure for obtaining an optimal set of model parameters was implemented. An optimal set of parameters was defined to be that set which is derived by minimization of an objective function which quantifies the dissimilarity between observed and simulated hydrologic flow or contaminant transport values. Function minimization on either a monthly or a daily basis was performed by a pattern search technique. A discussion of the OPTIMIZED TRANSPORT Model (OPTRM) was followed by a user's guide to the model. Also included were simulations of Walker Branch Watershed in which selected sets of hydrologic and potassium transport-related parameters are determined. The appendixes contained listings of the computer programs used. (Sims-ISWS)
W77-03115

PERMISSIBLE LEVEL OF BENZO(A)PYRENE IN WATER BODIES, (IN RUSSIAN), Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR). A. P. Il'Nitskii. Gig Sanit 3, p 100-104, 1975.

Descriptors: *Lethal limit, Data collections, *Toxicity, Water pollution, Rodents, Organic compounds.
Identifiers: Carcinogens, *Benzopyrene.

Two series of experiments were carried out to obtain basic data necessary for determining the permissible level of benzo(a)pyrene (BP) in water bodies. In the 1st series the effect of various doses of BP and its combinations with other polycyclic aromatic hydrocarbons was studied after oral administration to 2 strains of mice. In the 2nd series the effect of combined oral and intratracheal BP administration to random-bred rats was studied.

The data is analyzed in relation to possible extrapolation to humans.—Copyright 1976, Biological Abstracts, Inc.
W77-03117

TEMPORAL VARIATIONS IN TRIBUTARY PHOSPHORUS LOADS,
Rutgers - The State Univ., New Brunswick, N. J.
T. J. Tuffey, and F. B. Trama.
In: 'Urbanization and Water Quality Control,'
Whipple, W. Jr. (ed.), American Water Resources
Association, Proc. No. 20, June 1975, p 140-152. 7
fig, 8 ref. OWRT A-047-N.J.(1), 14-34-0001-7064.

Descriptors: Water quality, Water pollution
sources, Nutrients, *Phosphorus, Phosphates.
Identifiers: *Nonpoint source pollution, Storm
event pollution loadings, Temporal variations.

Total tributary phosphorus loading can be differentiated into that occurring during periods of low flow steady state and minor rainfalls and that occurring at high flow steady states (e.g., in the spring) and during major storms. During low flow conditions, relatively small loads are involved that are probably adequately represented in the available data base. During high flow conditions induced by storm events or seasonal patterns, major increments in phosphorus load occur. A single storm event contributed in a six-hour time period a TP load that is the equivalent of a 30-day low flow steady state loading. Storm-induced phosphorus pulses can significantly contribute to the annual TP load for other than urban watersheds. It is expected that this effect would be even greater in urban watersheds. Further studies are needed to define the characteristics and sampling frequency necessary to obtain a statistically reliable data base for determining phosphorus loads transported by tributary streams to receiving bodies of water.
W77-03123

LITTER AND OIL ON THE SHORES OF UTSIRA, ROGALAND COUNTY, DURING AUTUMN 1974, (IN DANISH),
V. Ree.
Fauna (Oslo) 28(4), p 185-191, 1975.

Descriptors: *Oil pollution, Oil spills, *Birds,
*Litter, Solid wastes, Waste disposal, Water pollution
sources, Shores, Path of pollutants.
Identifiers: Alca-torda, Larus-argentatus, Larus-
ridibundus, *Norway(Utsira area), Somateria-
mollissima, Sula-bassana, Uria-aalge, Utsira, *Sea
birds, Plotus-alles.

During ornithological field work on Utsira (Norway) a survey was made of the rubbish and oil pollution along the shores. A number of oiled sea birds were observed: Somateria mollissima, Uria aalge, Alca torda, Plotus alle, Sula bassana, Larus argentatus and L. ridibundus. The pollution situation along coasts of Norway is getting worse. Due to its geographical position, Utsira is one of the localities which will be affected first in the event of an oil catastrophe in the North Sea.—Copyright 1976, Biological Abstracts, Inc.
W77-03125

SANITARY-BACTERIOLOGICAL STUDY OF THE EFFECTIVENESS OF DECONTAMINATING THE SEWAGE OF VOROSHILOVGRAD ON SEWAGE FARMS, (IN RUSSIAN),
Voroshilovgradskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5D.
W77-03128

THE TRANSPORT OF POLLUTANTS IN GROUND WATER, (IN GERMAN),
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
H. Fluehler.
Eidg Anst Anst Forstl Versuchswes Mitt 51(1), p 255-266, 1975.

Descriptors: *Path of pollutants, *Groundwater,
Soils, Erosion, Water pollution sources, Sorption.

Transport, sorption and breakdown processes have greatly different effects on the erosion of various substances. The interrelationships between the substance transported, the soil and the ground water are very complex and must be simplified for a quantitative description. Established rules can be used only if the insignificant factors can be determined and eliminated. Possible simplifications and evaluation methods for substance transport in natural soils are discussed.—Copyright 1976, Biological Abstracts, Inc.
W77-03131

APPLICATION OF A MODEL FOR LAYOUT AND DESIGN OF SEWER SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
L. W. Mays, H. G. Wenzel, Jr., and J. Liebman.
Paper presented at the 1976 Spring Annual Meeting of the American Geophysical Union, Washington, D.C., April 13-15, 1976. 10 p, 7 fig, 7 ref.
OWRT C-4123(No. 9023)(6).

Descriptors: *Optimization, Urban drainage, Environmental engineering, Dynamic programming, Hydraulics, *Model studies, *Storm drains, *Design.
Identifiers: Urban development, Computer applications, Economic analysis.

An optimization model has been developed for the minimum cost layout and design of storm sewer systems. This model can be used to determine the optimal layout, size, and crown elevations of the sewer pipes and depths of the manholes. The optimization is achieved by using a screening model consisting of two conjunctive phases: a model for the combined layout and design and a supplementary design model for prescribed layouts. The combined layout and design model is an optimization procedure based upon discrete differential dynamic programming (DDDP) which simultaneously varies both the system layout and pipe design. Isodonal lines, which are imaginary lines separating manholes for investigation of possible pipe connections, are used to divide the system into stages for optimization. At each stage of the DDDP procedure, a connectivity model, which is formulated as a set-partitioning problem, is solved to determine the minimum cost layout for that stage. The combined layout and design model is an iterative stage by stage procedure resulting in a complete system layout and design after each iteration. When changes in the system layout occur for successive iterations of the combined model, the design model for given layouts is used to compute the optimal design of the previously generated layout by the combined layout and design model. The design model is also an iterative stage-by-stage optimization procedure based upon DDDP. The hydraulics of flow are accounted by using Manning's equation and peak flows at various manholes are added to compute flowrates for the connecting downstream pipes.
W77-03133

THE PHOSPHORUS POLLUTION OF WATERS DUE TO AGRICULTURE, (IN GERMAN),
Eidgenossische Forschungsanstalt fuer Agrikulturmehemie, Bern.
O. J. Furrer.
Eidg Anst Anst Forstl Versuchswes Mitt 51(1), p 267-283, 1975.

Descriptors: *Phosphorus, *Agricultural runoff, Water pollution sources, Agriculture, Fertilizers, Soil erosion, Path of pollutant.
Identifiers: *Switzerland.

Lysimetric studies and investigation on drainage, rain and surface water, and soil profiles were carried out. No danger of fertilizer phosphate erosion

exists because it settles in the uppermost layers. This increases the washing away of surface phosphate; measures are suggested for inhibiting this. Agriculture causes less than 10% of the phosphate water pollution in Switzerland. Studies reporting the sources of phosphate pollution in Switzerland are reviewed.—Copyright 1976, Biological Abstracts, Inc.
W77-03134

PLANKTON OF COASTAL LAGOONS: XI. TRANSPORT IN THREE ESTUARIES OF THE NORTHWEST OF MEXICO (NOVEMBER, 1973) (IN SPANISH),
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Biologia.
For primary bibliographic entry see Field 2L.
W77-03145

BEHAVIOR OF GROUND WATER SUBJECT TO IRRIGATION OF EFFLUENT - A CASE STUDY,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-03158

THE RELATIONSHIP OF BOTTOM SEDIMENTS TO BACTERIAL WATER QUALITY IN A RECREATIONAL SWIMMING AREA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
S. A. Winslow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 259, Price codes: A04 in paper copy, A01 in microfiche. Master of Science, Thesis, 1976. 60 p, 10 fig, 3 tab, 31 ref. OWRT A-053-ARIZ(4), 14-34-0001-6003.

Descriptors: *Water quality, Recreation, *Arizona, Swimming, Water sports, Coliforms, *Bottom sediments, Lake sediments, *Bacteria, Water pollution sources, Pollutant identification.
Identifiers: *Recreational waters, *Bacteriological pollutions, Central Arizona, *Canyon Lake(Ariz).

A study was conducted at Acacia Beach, Canyon Lake, Arizona, to clarify the influence of sediment-stored fecal bacteria on swimming area water quality. An additional goal was to determine the value and potential applications of fecal coliform analyses of bottom sediments for use in sanitary evaluations of natural swimming areas. Concentrations of fecal coliform in sediment were found to be significantly higher during the swimming season than during the nonswimming season. Analyses frequently found large, unpredictable changes in sedimentary fecal coliform concentrations over short time periods. Fecal coliform concentrations in nearshore sediment at Acacia Beach are apparently strongly influenced by currents, wave action and sediment agitation by bathers. Methods of analysis used in this study were not able to quantitatively determine the influence of sediment-stored bacteria on the overlying water at Acacia Beach. Use of fecal coliform analyses of bottom sediments as a stable index of overlying water quality or as a predictive device cannot be made from information collected in this study. However, sediment sampling to supplement routine water sampling is recommended to provide a more complete indication of the total sanitary condition of natural swimming areas.
W77-03167

EFFECT OF ZINC-COATED CULVERTS ON VERTEBRATE AND INVERTEBRATE FAUNA IN SELECTED MAINE STREAMS,
Maine Univ., Orono. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-03170

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

CALIBRATION OF A THERMAL ENRICHMENT MODEL FOR SHALLOW, BARRICADED ESTUARIES

University of South Florida, St. Petersburg. Dept. of Marine Science.

K. L. Carder, S. L. Palmer, B. A. Rodgers, and P. J. Behrens.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 218. Price codes: A04 in paper copy, A01 in microfiche. Completion Report, September 1976. 61 p, 18 fig, 4 tab, 23 ref, 2 append. OWRT-5083 (4232) (1).

Descriptors: *Thermal pollution, *Model studies, *Computer models, Diffusion, Friction, Calibration, Measurements, *Florida, Thermal power, Heat exchange, *Estuaries, Path of pollutants, Water temperature, Distribution, Dispersion. Identifiers: Barricaded estuary, Barotropic flow.

A new, semi-implicit, numerical model of thermal dispersion has been developed. It has been linked to an explicit, tidally driven hydraulics model of a barricaded estuary on the west coast of Florida. The model has been used to predict the distribution of temperature resulting from a seawater-cooled power generation facility near Crystal River, Florida. Manning numbers and diffusion coefficients have been determined for the modeled basin and verified by comparing characteristics of the calculated plume to those of the actual plume. Input variables included tidal height, power plant load, solar irradiance, air temperature, humidity, and pressure, and wind speed and direction. After five days of simulation for the period 6/15/75 to 6/19/75, the calculated plume area was within 15% of the measured acreage, and the calculated mean plume temperature differed from the measured value by only 0.05°C. W77-03171

IMMEDIATE INDUSTRIAL EFFECTS ON SEDIMENT MERCURY CONCENTRATIONS IN A CLEAN COASTAL ENVIRONMENT

Florida State Univ., Tallahassee. Dept. of Oceanography.

G. A. Knauer.

Marine Pollution Bulletin, Vol. 7, No. 6, June 1976, p. 112-115, 3 tab, 1 fig, 14 ref.

Descriptors: *Mercury, *Heavy metals, Sediments, Mineral industry, *Nickel, Water quality, *Australia, *Water pollution, *Bottom sediments, Industrial wastes, *Water pollution sources, Industrial wastes.

Identifiers: *Sediment mercury concentrations, *Nickel refinery, Halifax Bay (Australia), Mercury content, Surface sediment concentration, Subsurface samples.

Studies were initiated in May 1975 to determine the impact of a new nickel refinery on ambient mercury level in sediments taken from Halifax Bay, Australia. Although mercury levels were relatively low in all samples, surface sediments were found to contain 2.5-3.0 times the mercury concentration of subsurface samples. However, surface sediment samples collected adjacent to the refinery outfall within the first three weeks of continuous discharge showed significant increases in mercury levels when compared with surface samples taken from areas not affected by the refinery. (Katz) W77-03188

PELAGIC TAR IN THE NORWEGIAN COASTAL CURRENT

Institute of Marine Research, Bergen (Norway).

G. B. Smith.

Marine Pollution Bulletin, Vol. 7, No. 4, April 1976, p. 70-72, 1 fig, 9 ref.

Descriptors: *Oil, *Oil spills, Oily water, Atlantic Ocean, *Path of pollutants, Ocean currents, Drifting (Aquatic) Water circulation, Transportation, Solid wastes, *Periphyton, *Oil wastes, *Plankton.

Identifiers: Gulf steam, Norwegian Coastal Current, *Pelagic tar, Norwegian Coast, Skagerrak, Barents Sea, North Sea, *Norway.

Petroleum particulates were found in 117 of 220 neuston samples collected in the Norwegian Coastal Current during March-August 1975, at an average concentration of 0.11 mg/m². Highest concentrations were observed in the Skagerrak and Barents Sea. Lower densities occurred along the northwest Norwegian coast and in the North Sea. (Katz) W77-03190

DISTRIBUTION AND SOURCE OF TAR ON THE PACIFIC OCEAN

Department of the Environment, Victoria (British Columbia). Ocean Chemistry Div.

C. S. Wong, D. R. Green, and W. J. Cretney.

Marine Pollution Bulletin, Vol. 7, No. 6, June 1976, p. 102-105, 2 tab, 3 fig, 13 ref.

Descriptors: *Oil, Oil spills, Oily water, *Pacific Ocean, *Path of pollutants, *Ocean currents, Drifting (Aquatic), Water circulation, Transportation, *Ships, Water pollution, Solid wastes. Identifiers: *Tar lumps, Northwest Pacific Ocean, Kuroshio current, Tanker tank washing.

Petroleum residues, or tar lumps, are concentrated in the northwestern portion of the Pacific Ocean, particularly in the Kuroshio current system. The source of the tar appears to be tank washings from tankers on the very large Middle East to Japan route. Tar pollutants apparently are discharged by tankers south of Japan, become entrained in the Kuroshio current, and create a plume of contamination which extends downstream for 7000 km across the Pacific. (Katz) W77-03191

HEAVY METALS IN LAKES OF THE COEUR D'ALENE RIVER VALLEY, IDAHO

Idaho Univ., Moscow. Dept. of Zoology.

S. B. Bauer.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 388. Price codes: A04 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, November 1974. 55 p, 10 fig, 13 tab, 42 ref. (M.S. Thesis). OWRT C-4145 (No. 9060) (1).

Descriptors: *Heavy metals, *Trace elements, *Mining wastes, *Idaho, Lakes, Lake sediments, Zinc, Copper, Cadmium, Lead, Antimony, Spectrophotometry, Bass, Bullheads. Identifiers: Coeur d'Alene Lake, Spokane River, Coeur d'Alene River, Swan Lake, Blue Lake, Thompson Lake, Killarney Lake, Anderson Lake, Black Lake, Medicine Lake, Cave Lake, Rose Lake, Bells Lake, Cesium.

Heavy metal concentrations were measured in the water, sediments, and fish of nine small lakes located along the main stem of the Coeur d'Alene River. Mining wastes have been discharged into this drainage since the 1890's. Concentrations of dissolved metals were low in the lakes and did not differ significantly from lake to lake. Zn, Cu, Cd, Pb, Cs and Sb have accumulated in lake sediments. The concentrations of these metals varied in sediments from lake to lake, and within each lake were highest at stations close to the river. Zn, Cu, and Cd concentrations in muscle and liver of Yellow Perch were not significantly different between lakes. However, Zn and Cd concentrations in fish from several of the Coeur d'Alene lakes were significantly higher than in fish from a control area. Metal concentrations were somewhat related to trophic status, decreasing at higher trophic levels. Zn, Cu, and Cd concentrations were greater in benthic insects than in fish. The concentration of zinc in muscle was highest in Brown Bullheads (68 mg/kg), an omnivorous species, and lowest in Largemouth Bass (20 mg/kg), a piscivorous species. W77-03207

DISTRIBUTION OF LIGHT HYDROCARBONS, C1-C14, IN THE NORTHEAST GULF OF ALASKA AND THE SOUTHEASTERN BERING SHELF

National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.

J. Cline, and R. Feely.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigator's Reports for the Year Ending March 1976, Vol 9. Chemistry and Microbiology, p. 443-550, April 1976. 26 fig, 4 tab, 24 ref, 2 append.

Descriptors: *Alaska, *Seepage, *Oil spills, *Oil pollution, *Water quality, *Water pollution effects, *Baseline studies, *Environmental effects, Sediments, Organic compounds, Path of pollutants, Distribution.

Identifiers: *Outer Continental Shelf, *Bering Sea, Oil exploration, Oil development, *Biogenic sources, *Gulf of Alaska, Petroleum resources, Crude oils, Lease areas.

The low molecular weight hydrocarbon program was initiated in the OCS of Alaska in response to the environmental guidelines set forth in the Environmental Study Plan for the Gulf of Alaska, Southeastern Bering Sea and the Beaufort Seas. The purpose was to establish the spatial and temporal variations (seasonal and diurnal) in the dissolved hydrocarbon fraction composed of methane, ethane, ethylene, propane, propylene, isobutane and n-butane. These data are being collected in order to establish baseline levels of naturally-occurring hydrocarbons in the lease areas prior to exploration, development, and production of fossil fuel reserves. These components have proven to be valuable indicators of petroleum input arising from drilling, production, and transportation of crude oil and refined products. In support of the basic objectives, attention is being given to natural hydrocarbon sources, namely gas and oil seeps, production of hydrocarbons from near-surface sediments, and biogenic sources within the euphotic zone. (Sinha-OEIS) W77-03221

NATURAL DISTRIBUTION OF TRACE HEAVY METALS AND ENVIRONMENTAL BACKGROUND IN THREE ALASKA SHELF AREAS

Alaska Univ., College. Inst. of Marine Science.

D. C. Burrell.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 10. Chemistry and Microbiology, p. 1-145, April 1976. 16 fig, 38 tab, 57 ref. 03-5-022-56.

Descriptors: *Alaska, Pollutants, *Water quality, *Heavy metals, *Trace elements, *Resources development, Water pollution sources, *Baseline studies, Sediments, Chemical analysis, *Path of pollutants, Distribution.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Petroleum resources, Gulf of Alaska, Bering Sea, Beaufort Sea, Crude oils.

Baseline sample collection of water and sediment for the Gulf of Alaska and Bering Sea has been completed and some biota samples taken from these regions have also been received. Archived sediment samples from the Beaufort Sea have been analyzed, and a number of granulometric and clay mineralogy data for the surface sediment from all regions are included in this report. The contents of trace metals analyzed to date in the water show no anomalous trends and are as low (or lower) as in other reported data sets for open-ocean, uncontaminated regions. Mytilus and Fucus contents are, in general, lower than for other reported coastal areas. From data in hand it would appear that the Alaskan OCS might well, at the present time, serve as a type example of pristine coastal waters as far as heavy metal distribution are concerned. (Sinha-OEIS) W77-03222

HYDROCARBONS: NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF, Alaska Univ., College. Inst. of Marine Science. D. G. Shaw.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 10. Chemistry and Microbiology, p 193-366, April 1976. 11 ref, 2 append. 03-5-022-56.

Descriptors: *Alaska, Pollutants, *Water pollution sources, *Oil spills, *Seepage, *Oil pollution, *Water pollution effects, *Environmental effects, *Baseline studies, *Resources development, Biota, Sediments, Suspended solids, *Organic compounds. Identifiers: *Outer Continental Shelf, Seston, Gulf of Alaska.

The objectives of this continuing work are to determine the kinds and amounts of hydrocarbons in water, biota, sediment, and seston in the Alaskan OCS environments and to determine the extent to which hydrocarbons are adsorbed by suspended sediments of the Gulf of Alaska. These measurements provide the link between impacts, such as the decline of a biological population, and suspected causes of those impacts, such as the addition of petroleum to the system. Based on work so far completed, it appears that the levels of hydrocarbons in the Alaskan OCS environments are as low as, or lower than other areas of the world ocean not subject to obvious petroleum pollution. The general goal of this project is to measure the ambient kinds and amounts of hydrocarbons in various components of the Alaskan OCS environment and to study key processes by which added hydrocarbons are transported and degraded in this environment. The primary focus has been the Gulf of Alaska. (Sinha-OEIS) W77-03224

MICROBIAL RELEASE OF SOLUBLE TRACE METALS FROM OIL IMPACTED SEDIMENTS, Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 5C. W77-03225

INCIDENCE OF PATHOLOGY OF MARINE FISH DISEASES IN THE GULF OF ALASKA, BERING SEA, AND BEAUFORT SEA, California Univ., Davis. B. B. McCain, and S. R. Wellings. In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 10. Chemistry and Microbiology, p 381-433, April 1976. 14 fig, 2 tab, 50 ref.

Descriptors: *Alaska, *Baseline studies, *Water quality, *Resources development, *Distribution patterns, *Oil pollution, *Fish diseases, Pathology, Demersal fishes, Pollutant identification. Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Petroleum resources, Gulf of Alaska, Bering Sea, Beaufort Sea.

The main purpose of this investigation was to obtain baseline data on the present health status of demersal fishes in waters near Alaska's Outer Continental Shelf so that future environmental effects of oil exploration and development in these areas can be evaluated. The principal criterion of fish health being employed is the frequency of externally visible pathological conditions. In addition, the histopathological and microbiological properties of each major disease are being characterized. The geographical areas included in this work are the Bering and Beaufort Seas, and the Gulf of Alaska. During September and October, 1975, about 30,000 bottom-dwelling fish from the Bering Sea were examined for diseases. The three most commonly observed diseases and their frequency of occurrence were: epidermal papillomas of rock sole, 1.0%; lymphocystis of yellow-

fin sole, 2.1%; and epidermal tumors of the pseudobranch of adult Pacific cod, 7.4%. Environmental factors, such as low salinity, higher temperature, suspended sediments, and other factors which affect natural disease resistance, are thought to influence the prevalence of the virus-caused lymphocystis lesions which has never before been reported to occur in marine fish on the northern Pacific coast of North America. (Sinha-OEIS) W77-03226

DEVELOPMENT AND OPERATION OF HF CURRENT-MAPPING RADAR UNITS-PHYSICAL OCEANOGRAPHY, National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab. D. E. Barrick. In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 1-7, April 1976. 2 fig.

Descriptors: *Alaska, *Radar, *Ocean currents, *Water quality, *Baseline studies, *Resources development, *Water pollution sources, Coasts, Mapping. Identifiers: *Outer Continental Shelf, *Physical oceanography, *Petroleum resources, Oil exploration, Oil development, Gulf of Alaska.

The primary objectives of the program are twofold: to implement a proven radar concept into a transportable, easily assembled and operated pair of units capable of producing a map of near-surface currents on location in real time, and to calibrate the system as to its accuracy; and to operate the radars at coastal areas of interest along the Gulf of Alaska seacoast in support of the OCSEAP objectives in physical oceanography. (Sinha-OEIS) W77-03227

CURRENT MEASUREMENTS IN THE BEAUFORT SEA, Washington Univ., Seattle. Dept. of Oceanography. For primary bibliographic entry see Field 2L. W77-03228

NUMERICAL STUDIES OF ALASKAN REGION, National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab. J. A. Galt. In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 107-211, April 1976. 29 fig, 5 tab, numerous ref, 3 append.

Descriptors: *Alaska, *Circulation, *Numerical analysis, *Oil spills, *Oil pollution, *Water pollution, *Baseline studies, *Resources development, Model studies, Mixing, Dispersion, Meanders, Leases. Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Petroleum resources, Oceanographic processes, Satellite imagery, Trajectory analysis, Regional flow, Hydrocarbons.

The numerical modeling and simulation studies are designed to provide information on advection and diffusion processes, aid in the interpretation of observational data, and present the results in an easy to interpret integrated form. This is to be done for as many of the OCS areas as time and data allow. Tools are being developed that can be applied in any region where the dynamics is appropriately represented and data for verification and boundary condition specification are available. To date, the modeling studies in cooperation with the rest

of the physical oceanography program elements have been able to describe circulation patterns for some of the OCS region in considerable detail. In other areas, dominant physical processes have been identified and simulations have been initiated. From the results so far, it seems clear that these studies can integrate certain facets of the OCS program and present results that are a useful part of the assessment evaluation. Appendix I contains the text of an article, 'Circulation Studies on the Alaskan Continental Shelf Off the Copper River Delta' - use of diagnostic model with time-dependent barotropic mode simulation to estimate trajectories. (Sinha-OEIS) W77-03231

BRISTOL BAY OCEANOGRAPHIC PROCESSES (B-BOP), National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab. J. D. Schumacher, and L. K. Coachman. In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 213-247, April 1976. 14 fig, 13 ref. R7120849.

Descriptors: *Alaska, *Ocean circulation, Pollutants, *Oil pollution, *Water pollution, *Resources development, *Baseline studies, *Environmental effects, Dispersion, Tides, Flow characteristics, Hazards. Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, Oil development, Oceanographic processes, *Bristol Bay.

The objective of this work unit was to relate oceanic advective and diffusive processes to potential pollution problems due to OCS petroleum development. From data collected, processed, and analyzed to date, the following conclusions have been made. The mean flow during fall 1975 in Bristol Bay was small (on the order of 1 cm/sec) and was directed toward the northwest flowing along the 50m depth contour; most of the variance energy was in tidal frequency bands; and major events in the flow regime occurred as pulses in the mean flow. This study has provided initial information on mean transport and an indication of the relative importance of dispersion in the Bristol Bay region. (Sinha-OEIS) W77-03232

OUTER CONTINENTAL SHELF ENERGY PROGRAM, National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. D. V. Hansen. In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 267-274, April 1976.

Descriptors: *Alaska, *Oil pollution, Pollutants, *Ocean currents, *Ocean circulation, *Resources development, *Water pollution sources, *Environmental effects, *Baseline studies, Dispersion, Hazards, Surface waters. Identifiers: *Outer Continental Shelf, *Flow patterns, Oil development, Oil exploration, Gulf of Alaska, Hydrocarbons, Energy sources.

The general outline of this study is the acquisition of near surface flow trajectories throughout the entire N.E. Gulf of Alaska OCS region with particular emphasis on the lease area from Yakutat Bay to Prince William Sound. The device for acquiring this information is the NIMBUS-6 satellite and associated TWERLE/RAMS system. The development of improved diagnostic models allows prediction of pollutant trajectories based on the distribution of basic parameters. Also characteristic flow patterns are discernable allowing for

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

evaluation of petroleum development criteria based on projected pollutant impact zones. To date data shows that: near surface currents in the area are to the west as expected, and sustained speeds on the order of one knot are not unusual; there is indication of very strong topographic influence upon the flow in that current trajectories tend to parallel isobaths, and shoal areas appear to have a lead eddy structure, as might also be expected of islands, that may tend to retain pollutants; and surface pollutants released in the area off Yakutat Bay are likely to go ashore on or east of Kayak Island within two weeks. (Sinha-OEIS) W77-03234

PREPARATION OF HYDRODYNAMICAL-NUMERICAL AND 3-PARAMETER SMALL-MESH ATMOSPHERIC MODELS FOR COASTAL WATERS IN THE GULF OF ALASKA,

Naval Environmental Prediction Research Facility, Monterey, Calif.
T. Laevastu.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 275-292, April 1976. 15 fig.

Descriptors: *Alaska, Pollutants, *Ocean currents, *Advection, *Diffusion, *Weather forecasting, *Water pollution, *Resources development, *Baseline studies, *Environmental effects, Coasts, Sea level, Organic compounds.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Atmospheric models, Gulf of Alaska, Surface winds.

Three two-layer Hydrodynamical-Numerical (HN) models with overlapping boundaries have been programmed, covering the Alaskan coast of the Gulf of Alaska. The principal inputs of these models are tides (at the open boundaries), wind, 'permanent' (thermohaline) current and any release of pollutants. The principal outputs (either as time series at given locations, or as instantaneous area outputs at any given time) are currents, sea level and distribution of pollutants. The small-mesh meteorological model has been programmed to obtain detailed surface wind analyses/forecasts. It takes the boundary conditions from a 'standard' hemispheric analysis/forecast. Also available are spectroangular wave and surf forecasting models, though these were not part of this work unit. (Sinha-OEIS) W77-03235

MESOSCALE CURRENTS AND WATER MASSES IN THE GULF OF ALASKA,

Alaska Univ., College. Inst. of Marine Science.
T. C. Royer.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 293-358, April 1976. 11 fig, 8 ref, append. 03-5-022-56.

Descriptors: *Alaska, *Ocean circulation, *Oil pollution, *Ocean currents, Pollutants, *Upwelling, *Water pollution, *Baseline studies, *Environmental effects, *Resources development, Water quality, Sea level, Weather patterns, Storms, Tides, Diffusion, Dispersion.
Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil development, Oil exploration, *Gulf of Alaska, Mesoscale currents, Water masses, Nearshore circulation, Seasonal variations.

The objectives of this study were to define the physical-chemical environment, transports of pollutants and the long-term monitoring of the physical-chemical environment in the Gulf of Alaska. It was concluded that there are variations in the scale lengths (and probably time scales) of the physical processes in the Gulf of Alaska. The shortest scale lengths were found northeast of Kodiak Island

where very complex flows were seen. Another important conclusion is that nearshore surface water can be advected well offshore, as is apparently the case near Kayak Island. While the general flow is as expected, the perturbations on this flow have an important implication in the transport of pollutants. The temperature-salinity measurements show that the waters overlying the continental shelf in the northern Gulf of Alaska change on a seasonal basis. The causes of these changes are the input of heat and freshwater and variations in wind stress. Features in the vicinity of the shelf break and further offshore are semi-continuous around the gulf. The data indicate that the surface water inshore and eastward of Kayak Island moves southwestward and is located along the continental shelf break as it passes Kodiak Island. Apparently, there is a different surface water mass regime west of Kayak Island and inshore from Middleton Island. The changes in complexity of the horizontal structure of the water masses are evident from both the satellite and hydrographic data. These complexities disappear westward along the Alaska Stream. (Sinha-OEIS) W77-03236

TRANSPORT OF POLLUTANTS IN THE VICINITY OF PRUDHOE BAY, ALASKA,

National Environmental Research Center, Corvallis, Oreg.
R. J. Callaway, and C. Kobinsky.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 427-755, April 1976. Chiefly fig and tab. R-50813 and R-60813.

Descriptors: *Alaska, *Arctic Ocean, *Ocean circulation, *Oil pollution, *Water pollution, *Baseline studies, *Resources development, Environmental effects, *Pollutants, Tides, Flushing, Dispersion, *Path of pollutants.
Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, Oil development, *Pollutant transport, Surface currents, Prudhoe Bay, Simpson Lagoon.

A set of computer runs has been made on a section of the Arctic Coast centered about Prudhoe Bay. Large scale model simulations were reproduced in two fine-grid models interior of the larger area: Prudhoe Bay and Simpson Lagoon. Limited verification of the large-scale model was planned but not completed because of the 1975 ice year. Tide records collected during 1975 inside Thetis and Stockton Islands provide the basis for tidal amplitudes used as input to the models. Additional required input data (bottom topography, winds, runoff) were obtained from USGS, NOS and other sources. The objectives of the study are to determine flushing rates, retention times and pollutant transport in the vicinity of Prudhoe Bay. For this purpose, a single-layer model of circulation was applied in order to compute tidal elevations and surface currents. Inferences were made from the computer output as to probable transport rates and pollutant dispersion. The objectives of the study relate to potential drilling operations in a limited section of the Arctic Coast. Additional inferences can be made as to the influence of marine operations on the environment and vice versa. (Sinha-OEIS) W77-03238

MARINE CLIMATOLOGY OF THE GULF OF ALASKA AND THE BERING AND BEAUFORT SEAS,

Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
H. W. Searby.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 757-769, April 1976. 7 fig. 03-5-022-56.

Descriptors: *Alaska, *Climatic data, *Oil spills, *Oil pollution, *Resources development, *Baseline studies, *Environmental effects, Climatology.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Petroleum resources, *Gulf of Alaska, *Bering Sea, Beaufort Sea.

The objective of the project is to provide detailed marine and coastal climatology for input into the planning and operational phases of oil and gas development on the continental shelf. Specific objectives are to present information on temperature, precipitation, wind, and how they relate to such things as cloud cover, wave heights, and visibility (fog). Storm tracks and frequencies, storm surges and coastal flooding are being studied and will be part of the presentation. Such things as potential superstructure icing, tides, surface currents, immersion hypothermia and topography of both land and sea will also be included. Results for this project will be in the form of completed atlases, one each for the Gulf of Alaska, the Bering Sea, and the Beaufort Sea. (Sinha-OEIS) W77-03239

MARINE CLIMATOLOGY OF THE GULF OF ALASKA AND THE BERING AND BEAUFORT SEAS. PART III. CLIMATIC ATLASES,

Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
H. W. Searby, and W. A. Brower, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 770-786, April 1976. 16 fig.

Descriptors: *Alaska, *Meteorological data, *Resources development, *Baseline studies, *Environmental effects, *Hazards, Coasts, Air temperature, Ocean waves, Oil spills, Oil pollution, Water pollution.
Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, Oil development, *Climatic atlases, Marine climatology, Gulf of Alaska, Bering Sea, Beaufort Sea.

The investigation is to establish descriptive climatology and data analyses of marine and atmospheric parameters for the outer continental shelf waters of Alaska and determine if results have the necessary temporal and spatial resolution to provide an assessment of risks involved with operating energy related structures in these waters. The present study will provide three atlases to represent the total of the Alaskan waters and each will be based on more than 20 years of additional marine data. Also, as marine data are typically sparse in the near coastal zone, a zone of sharp gradients and complex climate, data for 49 coastal stations will be included. Such a combination should be the best possible climatological picture for the coastal waters of Alaska. The data processing is nearing completion. About 60% of the statistical graphs have been computer produced and plotting of parameter statistics for 360 charts in isopleth analysis begun. (Sinha-OEIS) W77-03240

PHYSICAL OCEANOGRAPHY OF THE GULF OF ALASKA,

National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
F. Favorite, and J. H. Johnson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 787-922, 61 fig, 61 ref.

Descriptors: *Alaska, *Ocean circulation, *Ocean currents, *Resources development, *Baseline studies, *Environmental effects, *Oil pollution, *Oil spill, Flow profiles, Oceanography.

Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, Oil development, *Flow regime, *Gulf of Alaska, *Physical oceanography, Oceanographic data.

This is a concise summary of the physical oceanography of the Gulf of Alaska with emphasis on water circulation and transport. It provides background information for OCSEAP field programs and should assist in determining the location and intensity of direct current measurements required to define patterns in this highly complex flow regime thereby determining the potential movement of oil spills from offshore drill sites. (Sinha-OEIS)
W77-03241

NEAR-SHORE ATMOSPHERIC MODIFICATION.

National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.

R. M. Reynolds, and B. Walter.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 923-992, April 1976. 30 fig, 42 ref, append. R-7120848.

Descriptors: *Alaska, *Meteorological data, *Oil pollution, *Water pollution, *Resources development, *Baseline data, *Environmental effects, Meteorology, Winds, Coasts, Atmosphere.
Identifiers: *Outer Continental Shelf, *Petroleum resources, *Oil exploration, *Oil development, Trajectory analysis, Large scale flow, Planetary boundary layer.

Many near surface meteorological processes act to modify the surface winds in the coastal regions of Alaska. The modification is generally extensive enough to seriously effect any attempts at relating synoptic weather maps to surface conditions. The oceanic water near the surface is strongly influenced by the surface stress. As the wind makes a change in speed or direction, the water near the surface is strongly affected almost immediately. Then with time, the momentum change diffuses downward modifying the interior flow on a much larger time scale. A thorough knowledge of coastal wind conditions are an important consideration in offshore industrial development through its effects both on mean flow and the trajectory of surface contaminants. The work is designed to define which processes are acting to modify coastal winds, how prevalent they are, and how far off shore they act. Shipboard measurements coupled with all available meteorological data have been utilized in this goal. In addition, a study of computer simulation of coastal meteorological conditions has been undertaken to assess the applicability of a numerical model in making predictions of coastal winds. (Sinha-OEIS)
W77-03242

COASTAL MORPHOLOGY AND SEDIMENTATION, GULF COAST OF ALASKA (GLACIAL SEDIMENTATION).

Rhode Island Univ., Kingston, Dept. of Geology. J. C. Boothroyd, M. S. Cable, and R. A. Levey.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 827-832, April 1976. 19 fig, 67 ref, 2 append. 03-5-022-82.

Descriptors: *Alaska, *Hazards, *Sedimentation, *Resources development, *Baseline studies, *Environmental effects, *Water pollution, *Cold regions, Glacial sediments, Ice, Weather data, Maps, Geologic investigations.
Identifiers: *Outer Continental Shelf, Oil development, *Gulf of Alaska, Coastal morphology, Shore facilities, Braided outwash fans.

The major emphasis of the project was to evaluate present rates of change in coastal morphology, with particular emphasis on the possible impact of man-induced changes. Also the purpose of the study was to locate areas where the coastal environment is likely to be changed by man's activities and evaluate the effect of these changes, if any; and to evaluate effect of various geologic processes on man's activities in specific areas along the coast. The major information products included in this report are a series of large-scale maps and charts accompanied by photographs that illustrate specific features on those maps. The maps and charts are: Location map for the West Malaspina Foreland and Icy Bay area; Geologic hazards and processes map of the West Malaspina Foreland and Icy Bay area; Preliminary bathymetric chart of Icy Bay; and Environmental map of the east margin of Icy Bay. An appendix is included containing a table of weather data and drift observations collected during the summer field season and a reprint of a paper (Boothroyd and Ashley, 1975) discussing outwash fan sedimentation on the northeast Gulf of Alaska, including Yana Stream on the West Malaspina Foreland. (Sinha-OEIS)
W77-03244

COASTAL DYNAMICS AND SEDIMENT TRANSPORTATION, NORTHEAST GULF OF ALASKA.

South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-03245

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN.

Alaska Univ., College. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-03246

DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE GULF OF ALASKA AND SOUTHEASTERN BERING SHELF.

National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W77-03248

OFFSHORE PERMAFROST STUDIES, BEAUFORT SEA.

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03249

MARINE ENVIRONMENTAL PROBLEMS IN THE ICE COVERED BEAUFORT SEA SHELF AND COASTAL REGIONS.

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03250

SURFACE CURRENT OBSERVATIONS - BEAUFORT SEA, 1972.

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03251

DISTRIBUTION AND CHARACTER OF ICINGS IN NORTHEASTERN ALASKA.

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2C.
W77-03252

A 'HERRING-BONE' PATTERN OF POSSIBLE TAYLOR-GORTER-TYPE FLOW ORIGIN SEEN IN SONOGRAPHS.

Geological Survey, Menlo Park, Calif.
L. J. Toimil, and E. Reimnitz.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 12. Geology, p 626-640, April 1976. 4 fig, 15 ref.

Descriptors: *Alaska, *Flow characteristics, *Arctic Ocean, *Resources development, *Baseline studies, *Environmental effects, *Water pollution, Lagoon, *Sonar, Path of pollutants.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Herring-bone patterns.

The potential usefulness of side-scan sonar in detailed studies of helical flow phenomena is indicated by records obtained within a shallow Arctic lagoon. The records reveal a 'herring-bone' like pattern of current aligned linear reflectors with branching diagonals. Major longitudinal reflectors have no detectable relief and are believed to represent current-aligned, winnowed zones of the lagoon's silty fine sand. The winnowing processes are interpreted to occur along regions of helical cell divergence, suggesting a three-dimensional Taylor-Gortner flow origin. (Sinha-OEIS)
W77-03253

HEAVY-MINERAL TRENDS IN THE BEAUFORT SEA.

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03254

YUKON DELTA COASTAL PROCESSES STUDY.

Wesleyan Univ., Middletown, Conn. Dept. of Earth and Environmental Sciences.
For primary bibliographic entry see Field 2L.
W77-03255

FAULT HISTORY OF THE PRIBILOF ISLAND AND ITS RELEVANCE TO BOTTOM STABILITY IN THE ST. GEORGE BASIN.

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03256

EARTHQUAKE ACTIVITY AND GROUND SHAKING IN AND ALONG THE EASTERN GULF OF ALASKA.

Geological Survey, Menlo Park, Calif. Office of Earthquake Studies.
For primary bibliographic entry see Field 2L.
W77-03257

EROSION AND DEPOSITION OF SHELF SEDIMENT: EASTERN GULF OF ALASKA.

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03258

FAULTING AND INSTABILITY OF SHELF SEDIMENTS: EASTERN GULF OF ALASKA.

Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03259

SEISMIC AND VOLCANIC RISK STUDIES - WESTERN GULF OF ALASKA.

Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W77-03260

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

OFFSHORE PERMAFROST-DRILLING, BOUNDARY CONDITIONS, PROPERTIES, PROCESSES AND MODELS.
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp, and W. D. Harrison.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 138-256, April 1976. 15 fig, 1 ref, 5 append, chiefly data charts. 03-5-022-55.

Descriptors: *Alaska, *Permafrost, *Drilling samples, *Oil pollution, *Water pollution, *Environmental effects, *Resources development, *Baseline studies, Soil analysis.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Prudhoe Bay, *Boundary conditions.

A subsea permafrost drilling program was carried out during late April and May 1975 at a site near the northwest side of Prudhoe Bay, Alaska. Two-meter thick fast ice was used as a drilling platform to drill into the seabed. This report describes the drilling and sampling procedures used. The techniques and results of the soil analysis, temperature measurements, salt concentration measurements, permeability measurements, and penetration tests are also given. Field drilling logs are included. (Sinha-OEIS)
W77-03261

BEAUFORT SEACOAST PERMAFROST STUDIES.
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W77-03262

FAULTING AND INSTABILITY OF SHELF SEDIMENTS - WESTERN GULF OF ALASKA.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03264

A HISTORICAL SUMMARY OF EARTHQUAKE EPICENTERS IN AND NEAR ALASKA.
National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
For primary bibliographic entry see Field 7C.
W77-03265

A STUDY OF BEAUFORT SEA COASTAL EROSION - NORTHERN ALASKA.
For primary bibliographic entry see Field 2L.
W77-03266

DYNAMICS OF NEAR-SHORE ICE.
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W77-03268

MORPHOLOGY OF BERING NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING.
Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.
W77-03272

MORPHOLOGY OF BEAUFORT NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING.
Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.
W77-03273

EXPERIMENTAL MEASUREMENTS OF SEA ICE FAILURE STRESSES NEAR GROUNDED STRUCTURES.
Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.

W77-03274

OPERATION OF AN ALASKAN FACILITY FOR APPLICATIONS OF REMOTE-SENSING DATA TO OCS STUDIES.
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 7B.
W77-03277

THE COMPOSITION OF RAINWATER AT TWO SITES NEAR TOWNSVILLE, QLD. (AUSTRALIA).
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Div. of Soils.
For primary bibliographic entry see Field 2K.
W77-03279

A STUDY OF THE SUSPENDED PARTICULATE PROBLEM IN THE DUWAMISH BASIN.
Boeing Co., Seattle, Wash.
For primary bibliographic entry see Field 5A.
W77-03291

BEAR RIVER EVALUATION REPORT, 1974 SURVEY.
Environmental Protection Agency, Seattle, Wash. Region X; and Environmental Protection Agency, Seattle, Wash. Surveillance and Analysis Div.
B. Schmidt, and K. Beck.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 650. Price codes: A08 in paper copy, A01 in microfiche. Report EPA-910/8-75-091, July 1975. 165 p, 4 fig, 7 ref, 3 append.

Descriptors: *Water quality, *Surveys, *Rivers, *Idaho, Sampling, Standards, *Water quality standards, Water pollution, Pollutants, *Pollutant identification, Water pollution sources, Biochemical oxygen demand, Coliforms, Pesticides, Heavy metals, Mercury, Turbidity, Hydrogen ion concentration, Dissolved oxygen, Water temperature, Nutrients, Bacteria, Watersheds(Basins), Water pollution control.
Identifiers: *Bear River Basin(Idaho).

The quality of the waters in the Bear River Basin was surveyed from August 27 to August 29, 1974. The purposes of the survey were to determine point and non-point source loading, to determine whether water quality has improved since the adoption of the 1958 Enforcement Conference pollution control measures, to determine the cause and effect relationships between major waste sources and receiving water quality, and to determine whether major waste sources are complying with their NPDES permits. Survey results showed violations of Idaho Water Quality Standards in these parameters: bacteria, turbidity, and dissolved oxygen. Also, level of Lindane, a chlorinated hydrocarbon pesticide, and mercury significantly higher than the recommended maximal levels were found in the upper reaches of the Bear River. Although sufficient data since 1958 were not available to evaluate the pollution control measures, water quality changes in BOD's and total coliform bacteria were noted. The Monsanto Company was found to comply with their NPDES permit in all but one area, there was an apparent temperature violation. Nutrient loading was investigated and related to algal productivity, but not all loading sources were located. Other findings included realization that point sources did not appreciably affect the quality of the Bear River except in very localized areas. (Sims-ISWS)
W77-03292

COMPUTER MAPPING OF WATER QUALITY IN SAGINAW BAY WITH LANDSAT DIGITAL DATA.
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.

W77-03305

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST REPORT.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03306

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX A, OPERATIONAL AND WATER QUALITY DATA, 1968.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03307

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX B, OPERATIONAL AND WATER QUALITY DATA, 1969.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03308

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX C, OPERATIONAL AND WATER QUALITY DATA, 1970.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03309

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX D, EFFECTS OF ARTIFICIAL DESTRATIFICATION ON TEMPERATURE AND DISSOLVED OXYGEN IN ALLATOONA RESERVOIR.
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 5G.
W77-03310

SALINITY INDUCED HORIZONTAL ESTUARINE CIRCULATION.
Texas A and M Univ., College Station, Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-03312

WATER QUALITY SIMULATION OF TAHOE-TRUCKEE SYSTEM, NEVADA-CALIFORNIA - VOLUME II - APPENDICES.
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 5A.
W77-03351

THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS.
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5C.
W77-03354

RESIDUAL WASTE MANAGEMENT RESEARCH AND PLANNING PROJECTS, SEPTEMBER 1975.
Environmental Protection Agency, Washington, D. C. Water Planning Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 954. Price codes: A15 in paper copy, A01 in microfiche. Report No. EPA-440/9-76-003, September, 1975. 363 p, 102 ref.

Descriptors: *Waste disposal, *Reclamation, *Water pollution, *Social aspects, *Economics, Governmental interrelations, Cost-benefit analysis, Sludge disposal, Regional development, Urbanization, Groundwater, Surface waters, Abstracts.

Approximately 100 abstracts of documents dealing with the subject of residual wastes and their impact on ground and surface waters are presented. The abstracts provide project or publication identification, a brief summary of the document, the status of the project, information sources, and acquisition details. The abstracts are arranged by types of residual wastes and are cross-referenced where necessary. Some basic topics covered include: urban planning, regional planning, sludge disposal, water pollution, material recovery, cost-benefit analysis, residual waste reclamation, residual waste disposal, and socio-economic and intergovernmental aspects of the impact of residual wastes. (Kreager-FIRL)
W77-03355

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, AND CHEMICAL OCEANOGRAPHY.

National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75-11386. Price codes: A05 in paper copy, A01 in microfiche. Report No. ERL 332-MESA 3, R.L. Charnell, editor. April, 1975. 92 p, 57 fig, 5 tab, 35 ref.

Descriptors: *Waste disposal, *Sewage sludge, *Bays, *Circulation, *Water pollution, Sludge disposal, Water circulation, Solid wastes, Nutrients, Nitrites, Nitrites, Silicates, Phosphates, Organic compounds, Carbon, Sediments, New York, Water sampling.
Identifiers: Offshore dumping, *New York Bight, Nutrient distributions, Bight waters.

An assessment of the effects of offshore dumping in the New York Bight is presented. Fine-grained waste dumped in New York Bight is entrained in a clockwise circulation pattern and is dispersed to the north. A significant portion is deposited in the low area immediately northwest of the dumpsites. Christiaensen Basin, a natural zone of mud deposition, is significantly contaminated with sewage sludge. Water sampling data show that nutrient (nitrate, nitrite, silicate, and phosphate) distributions are dominated by the lower New York Bay outflow, with dumped sewage sludge contributing very small amounts. The carbohydrate/total organic carbon ratio of samples taken from the bight indicates that the whole bight contains some sewage-derived materials, with the greatest concentration occurring in the Hudson Shelf Valley, the Christiaensen Basin, and north of the geographical sewage sludge dumpsites. Although the presence of sewage-derived material is suggested by carbohydrate/total organic carbon ratios in sediments throughout the area close to Long Island, low total organic carbon values found in all but isolated pockets demonstrate that contaminant material comprises only a small fraction of the sediments. (Kreager-FIRL)
W77-03358

REACTIONS OF HEAVY METALS WITH SOILS WITH SPECIAL REGARD TO THEIR APPLICATION IN SEWAGE WASTES,

Melbourne Univ., Parkville (Australia). Dept. of Agricultural Chemistry.
G. W. Leeper.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-019 471. Price codes: A05 in paper copy, A01 in microfiche. November, 1972. 77 p, 5 tab, 66 ref. Department of the Army Contract No. DACW73-73-C-0026.

Descriptors: *Heavy metals, *Soil chemical properties, *Sewage, *Irrigation, *Plant growth, Nutrients, Metals, Sewage disposal, Toxicity, Nitrogen, Phosphorus.

Reactions of heavy metals with soils are reviewed, with particular emphasis on their application during the irrigation of crop lands with liquid sewage. Topics discussed include: the fate of heavy metals in soils, the mechanisms of removal of individual or grouped heavy metals, and the uptake and tolerance of heavy metals by plants. The use of specialists crops for harvesting unwanted accumulations of heavy metal does not appear to be feasible. As an alternative, the removal of metal-laden top soil is suggested so that the subsoil rich in nutrients from previous applications of nitrogen and phosphorus can be utilized. (Kreager-FIRL)
W77-03359

THE IMPACT OF FARGO, NORTH DAKOTA'S WASTE DISCHARGES ON THE INTERSTATE WATERS OF THE RED RIVER OF THE NORTH, SEPTEMBER 1969-APRIL 1970.

Federal Water Quality Administration, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 755. Price codes: A03 in paper copy, A01 in microfiche. July, 1970. 31 p, 4 fig, 8 tab.

Descriptors: *Water pollution, *Rivers, *Sewage treatment, *Treatment facilities, *Water pollution effects, Monitoring, On-site investigations, Dissolved oxygen, Biochemical oxygen demand, Suspended solids, Surface waters, North Dakota, Efficiencies, Performance, Waste treatment, Effluents, Bacteria, Organic compounds.

The impact of waste discharges from Fargo, North Dakota's sewage treatment plant on the Red River of the North was evaluated during field study conducted from September 1969 to April 1970. The total pounds of biochemical oxygen demand (5-day) discharged from the Fargo-Moorhead area during the survey period ranged from 4203/day in March to a high of 44,241/day in October. The quantity of wastes from Fargo steadily increased as the efficiency of the Fargo sewage treatment plant declined during the winter months, with Fargo contributing a maximum of 82% of the total organic waste load discharged from the Fargo-Moorhead area in March. The combined waste discharges from the Fargo-Moorhead area had an adverse effect on the water quality of the Red River of the North as evidenced by numerous violations of dissolved oxygen and bacterial criteria and violations of the state effluent requirements. Monthly averages of dissolved oxygen concentrations less than 5 milligrams/liter were observed for samples collected during the winter months. Monthly average effluent concentrations for samples taken from the Fargo sewage treatment plant always exceeded North Dakota's effluent criteria of 25 milligrams/liter biochemical oxygen demand and 30 milligrams/liter total suspended solids. (Kreager-FIRL)
W77-03361

REPORT ON POLLUTION IN LAS VEGAS WASH AND LAS VEGAS BAY.

Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Technical Services.
For primary bibliographic entry see Field 5C.
W77-03371

EVALUATION OF LAKE MILNER WATER QUALITY MODEL.

Environmental Protection Agency, Seattle, Wash. J. Yearsley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 651. Price codes: A05 in paper copy, A01 in microfiche. Working Paper No. EPA 910/8-75-092, July 1975. 82 p, 29 fig, 18 tab, 14 ref.

Descriptors: *Dissolved oxygen, *Water pollution sources, *River flow, Mathematical models, Industrial wastes, Impoundments, Pollution abatement, Water quality, River basins, *Idaho.

Identifiers: *Snake River (Idaho), Minidoka Dam (Idaho), Milner Dam (Idaho), National Pollution Discharge Elimination System permits, Point source pollution, Non-point source pollution, *Lake Milner (Idaho).

Dissolved oxygen levels in the Milner reach of the Snake River, between Minidoka Dam and Milner Dam in southwestern Idaho, are influenced strongly by river hydrology and point source discharge of organic wastes. Non-controllable factors, including sediment demand, surface transfer and non-point source biological oxygen demand, are also important. The Milner reach had been classified as water quality limited, with extended periods of low dissolved oxygen and especially critical conditions during periods of low flow when discharges from municipal and industrial waste sources were at their peak. In 1974 National Pollutant Discharge Elimination System permits were drafted for two industrial waste sources in the Burley-Heyburn area, and the permit writing process was supported by mathematical modelling which showed that point source discharges would contribute measurably to the violation of dissolved oxygen standards even if the discharge satisfied appropriate existing guidelines. The purpose of the present survey was to provide data for validating the mathematical model and to assess ambient water quality during low flow. A compliance monitoring program for industrial and municipal waste sources in the area was designed to be conducted concurrently with the in-stream survey. (Harris-Wisconsin)
W77-03373

THE IMPACT OF A FOREST FIRE ON A WILDERNESS LAKE IN NORTHEASTERN MINNESOTA.

Minnesota Univ., Minneapolis. Limnological Research Center.
J. P. Bradbury, S. J. Tarapchak, J. C. B. Waddington, and R. F. Wright.
In: Verhandlungen Internationale Vereinigung Limnologie, Vol 19, Part II, p 875-883, 1975. 7 fig, 1 tab, 14 ref.

Descriptors: *Lakes, *Forest fires, *Minnesota, Forests, Nutrients, Runoff, Environmental effects, Phosphorus, Paleolimnology, Watersheds (Basins), Oligotrophy, Phytoplankton, Chemical analysis.

Identifiers: *Meander Lake (Minn), Dogfish Lake (Minn), Boundary Waters Canoe Area.

Possible forest fire induced limnologic changes are evaluated by comparing the post-fire hydrology, chemistry and phytoplankton biology of the nearly virgin-forested watershed of Meander Lake with that of the similar, unburned nearby Dogfish Lake, and by a detailed paleolimnologic analysis of a 60-cm core of Meander Lake surface sediments. The impact of the Little Sioux fire on the chemical and hydrologic processes was evaluated by comparing cation budgets. This comparison showed that runoff increased 60%, potassium and phosphorus exports increased 265% and 93% respectively, and calcium, magnesium, and sodium exports did not change significantly. Nutrient losses were less than observed elsewhere and there was no drastic increase in nitrate export. Increased phosphorus loading of Meander Lake was only 38% greater than that of Dogfish Lake, falling within the natural year-to-year variation. This increase did not have a pronounced effect on the standing crop of phytoplankton. Paleolimnologic analysis of sediment cores suggest that while logging activities before the fire may have had a real impact on the limnology of the lake, the fire had little impact despite the fact that it burned nearly 70% of the watershed. It is concluded that while the Little Sioux fire, a spring fire, may not be typical of late summer and fall fires, nutrient losses from it were minimal. (Luedtke-Wisconsin)
W77-03375

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

THE PRIMARY PRODUCTION OF LAKE SIBAYA, KWAZULU, SOUTH AFRICA.
For primary bibliographic entry see Field 5C.
W77-03376

LAKE PHOSPHORUS LOADING GRAPHS: AN ALTERNATIVE.
Environmental Protection Agency, Corvallis, Oreg. Eutrophication and Lake Restoration Branch.
For primary bibliographic entry see Field 5C.
W77-03377

WATER POLLUTION SURVEILLANCE IN THE UNITED STATES. REPORT NUMBER 1, MISSOURI RIVER MAIN STEM, 1958-1962.
Public Health Service, Washington, D. C. Water Quality Section.
For primary bibliographic entry see Field 5A.
W77-03379

WATER QUALITY IN THE CALUMET AREA. CONFERENCE ON POLLUTION OF LOWER LAKE MICHIGAN, CALUMET RIVER, GRAND CALUMET RIVER, LITTLE CALUMET RIVER, AND WOLF LAKE, ILLINOIS AND INDIANA.
Department of Health, Education, and Welfare, Washington, D.C. Technical Committee on Water Quality.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 377.
Price codes: A07 in paper copy, A01 in microfiche. September 1970. 140 p. 8 fig., 48 tab.

Descriptors: *Lake Michigan, *Water pollution sources, *Water quality standards, *Industrial wastes, Lakes, Streams, Rivers, Pollution abatement, Pollutants, Illinois, Indiana, Interstate rivers, Interstate commissions, Legal aspects, Water quality.
Identifiers: *Calumet River(III-Ind), Grand Calumet River, Little Calumet River, Wolf Lake(III-Ind).

Despite initiation of numerous pollution abatement measures in compliance with the Calumet Area Conference requirements stipulated at various meetings since 1965, not all water quality criteria have been met at all control points in the heavily-industrialized area and additional abatement measures are necessary. A review committee with an intergovernmental agency membership reports these water quality changes: (1) In open water there has been a deterioration of water quality in terms of threshold odor, oil and grease. Total phosphorus levels remain the same and other parameters show an improvement or no change. (2) In the inner harbor basin water quality has decreased because of grease and oil levels. Most other parameters, including total phosphorus, show little or no change. (3) No significant change is found in shore water. (4) Waters of the Grand Calumet River east to the Indiana Harbor Canal show improvement in most parameters. (5) Waters of the Grand Calumet River west to Illinois have deteriorated. (6) In the Little Calumet River west to Illinois, in Wolf Lake and in the Calumet River along the lake side of the O'Brien locks there has been no significant change except for bacterial water quality deterioration at Hammond Beach on Wolf Lake and a slight improvement at the mouth of the Calumet River. (Harris-Wisconsin)
W77-03382

POLLUTION OF INTERSTATE WATERS OF THE LOWER COLUMBIA RIVER BONNEVILLE DAM TO CATHLAMET, WASHINGTON.
Public Health Service, Portland, Oreg. Div. of Water Supply and Pollution Control.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 742.
Price codes: A05 in paper copy, A01 in microfiche. August 1976. 85 p. 3 fig., 4 tab., 6 append.

Descriptors: *Pulp and paper industry, *Slime, *Fishing, *Columbia River, Pulp wastes, Saw mills, Wood wastes, Fibers(Plant), Water pollution sources, Organic wastes, Sulfite liquors, Commercial fishing, Sport fishing, Interstate rivers, Rivers, Nutrients, Pacific Northwest U.S., Biochemical oxygen demand.
Identifiers: Willamette River.

A summary report on pollution sources and effects along a 104-mile section of the lower Columbia shows that average daily biochemical oxygen demand (BOD) from pulp and paper mill waste loadings added to the river increased from 613,000 pounds in 1959 to 778,000 pounds in 1964. These wastes, nearly six times as great as those from all other sources combined, are primarily responsible for the development of abundant slime growths that flourish in the river and interfere with commercial and sport fishing by fouling nets and gear. Wood and fibers, moreover, add strength and body to the slimes and make them more difficult to remove from the equipment. The mills from Camas to Longview discharge these fibers along with dissolved organic wastes. Fiber decomposition is so slow that with existing river flows the increment of fibers from each successive waste discharge increases the downstream concentration. Slime is especially troublesome when river flow rates are less than 220,000 cubic feet per second and the water temperature 10-15 degrees centigrade. Pulp and paper mills should design and build mechanically-cleaned primary treatment facilities for mill wastes. Next, BOD loadings derived from spent sulfite liquor discharged by the industry at Camas and Vancouver should be reduced, and liquor solids should no longer be barged to the Columbia from its tributaries. (Harris-Wisconsin)
W77-03385

AQUATIC FIELD SURVEY AT IOWA ARMY AMMUNITION PLANT.
Environmental Control Technology Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W77-03386

BREAKUP FLOODING AND NUTRIENT SOURCE OF COLVILLE RIVER DELTA DURING 1973.
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
R. A. Hamilton, C. L. Ho, and H. J. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A009 551. Price codes: A02 in paper copy, A01 in microfiche. In: The Coast and Shelf of the Beaufort Sea; J. C. Reed and J. E. Sater (eds.), The Arctic Institute of North America, Arlington, Va. 1974; p. 637-648. (Reprinted as Technical Report No 188, ADA009551, June 1975. 7 fig, 2 tab, 8 ref).

Descriptors: *Ice breakup, *Nutrients, Seasonal, Vertical migration, Arctic Ocean, Ice-water interfaces, Sea ice, Rivers, Permafrost, Tundra, *Alaska, Cold regions, Estuaries, Inorganic compounds, Phytoplankton, Annual flood, Deltas.
Identifiers: *Colville River delta(Alaska), Beaufort Sea.

Spring breakup flooding of the Colville River in northern Alaska plays a significant role in raising the inorganic nitrogen level and the ratio of inorganic nitrogen to phosphate to a more nutrient-balanced state for phytoplankton assimilation in the nearshore waters of the Beaufort Sea area of the Arctic Ocean. The Colville is similar to rivers in other climatic regions characterized by pronounced seasonal variation in that it has distinct periods in its annual hydrologic cycle. The Colville ceases to flow during much of the winter. During breakup in early June, its floodwater moves seaward beneath the sea ice but above the sea water. Comparisons of analyses made of vertical offshore variations show no significant varia-

tion in nutrient concentration during the winter. But with the breakup, vertical variations become pronounced. The freshwater layer showed microgram levels per liter for various inorganic nutrients to be 50% to 300% greater than the levels obtained from the seawater specimens. With the onset of winter, seawater penetrates upstream beneath the ice and becomes dominant in all channels connected with the coastal waters. Melt water usually appears in the latter part of May. When it reaches sufficient depth, it flows downstream to the sea on top of the bottom fast ice and beneath the floating ice cover. The flow flushes sea water from the channels within two or three days. (Harris-Wisconsin)
W77-03388

DEGRADATION MECHANISMS: CONTROLLING THE BIOACCUMULATION OF HAZARDOUS MATERIALS.
National Environmental Research Center, Cincinnati, Ohio. Solid and Hazardous Waste Research Lab.
C. J. Rogers, and R. E. Landreth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 748. Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-670/2-75-005, January 1975. 14 p. 3 fig, 1 tab, 18 ref. 1DB311; ROAP 07ADZ; Task 10.

Descriptors: *Biodegradation, Path of pollutants, Pesticides, Toxicity, Agricultural chemicals, Industrial wastes, Chemical wastes, Metabolism, Persistence, Degradation(Decomposition), Environmental effects, Enzymes, Toxins.
Identifiers: *Bioaccumulation, *Hazardous materials, Photodegradation.

Mechanisms which transform toxic or hazardous substances, generated for commercial, industrial and agricultural uses into other toxically-active and inactive compounds, are delineated. Methods to minimize the release of unwanted chemicals into the environment are also described. Hydrolysis, oxidation, reduction, dealkylation, desulfuration and dehalogenation play an important role in the biotransformation of organochlorine, organophosphorus and carbamate insecticides in insects. Some of these basic enzymatic reactions in pesticide metabolism are illustrated. Mechanisms for the metabolic transformation of pesticides containing aromatic structures are also given. Parathion, methyl parathion, DDT, dieldrin, 2,4-D, MCPA, silvex, fenac, dalapon, atrazine and DCPA are metabolized both by the target organisms at which they are directed and by man and other nontarget species. Photodegradation is a natural process by which compounds such as DDT are transformed into a product as toxic or more toxic than the parent chemical. Bioaccumulation of chemicals such as heavy metals and chlorinated hydrocarbons in living cells was also reported. Technology alternatives to reduce the impact of these materials include the concentration process utilizing reverse osmosis, ion exchange, activated carbon adsorption and impoundment techniques, and the detoxification process utilizing chemical oxidation/reduction, catalytic, and substitution/transformation techniques. (Luedtke-Wisconsin)
W77-03391

ELEMENTAL DISTRIBUTION DIAGRAMS FOR BIOLOGICAL WASTEWATER TREATMENT.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-03429

THE APPLICATION OF THE FOAM FRACTIONATION PROCESS TO THE REMOVAL OF VIRUSES. PART I. THE PRODUCTION OF A

MATHEMATICAL MODEL TO PREDICT THE EFFICIENCY OF VIRUS REMOVAL,
Trent Polytechnic, Nottingham (England). Dept. of Life Sciences.
For primary bibliographic entry see Field 5D.
W77-03433

BIOCHEMICAL MECHANISMS IN THE METHANE FERMENTATION OF GLUTAMIC AND OLEIC ACIDS,
Buck, Seifert and Jost, Englewood Cliffs, N. J.
For primary bibliographic entry see Field 5D.
W77-03441

A STUDY OF MIXING CHARACTERISTICS OF SEWAGE STABILIZATION PONDS WITH RADIOACTIVE TRACERS,
Birmingham Univ., (England), Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-03461

NITRATE MONITORING.
For primary bibliographic entry see Field 5A.
W77-03468

INVESTIGATION OF OXYGEN TRANSFER TO SLIME AS A SURFACE REACTION,
Toledo Univ., Ohio. Dept. of Chemical Engineering.
E. J. Lee, K. J. De Witt, G. F. Bennett, and J. L. Brockwell.
Water Research, Vol. 10, No. 11, p 1011-1017, 1976. 2 fig, 3 tab, 15 ref.

Descriptors: *Sewerage, *Analytical techniques, Oxygen, *Slime, Surfaces, Nutrients, Laminar flow, Tubes.
Identifiers: *Oxygen transfer.

An oxygen, nutrient-laden water flow in steady laminar motion in a circular tube whose inner surface is covered with a thin layer of microorganisms was used to determine oxygen transfer to slime. Dissolved oxygen diffuses to the slime-fluid interface and is consumed in a reaction of arbitrary kinetic dependence on oxygen concentration. The first part of each experiment investigated the growth of the slime and the attainment of steady state in overall oxygen utilization. The second part was to determine if the flow-averaged oxygen concentration of the reactor effluent was a function of axial length. Controlling factors of oxygen utilization rates are the rate at which oxygen diffuses through the inert surrounding material to the microorganisms and the kinetics of reaction of the oxygen in biochemical reactions. Aerobic utilization of dissolved organic matter by a slime film depends on the availability of oxygen to act as a final electron acceptor in the final biochemical reactions. The second part of the experiment indicated that the oxygen-microorganism reaction was zero order. It is concluded that in a continuous flow, steady state system, reaction kinetics between dissolved oxygen and the attached thin layer of microorganisms generated by raw sewage do not depend on the dissolved oxygen concentration. (Collins-FIRL)
W77-03476

PHOTOLYSIS OF 5-CHLOROURACIL IN NATURAL WATERS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
G. R. Southworth, and C. S. Gehrs.
Water Research, Vol. 10, No. 11, p 967-971, 1976. 3 fig, 20 ref.

Descriptors: *Pollutant identification, Water types, *Stability, *Chemical reactions, *Aqueous solutions, Ultraviolet radiation, Solar radiation, Kinetics.
Identifiers: *Photolysis, *Chlorouracil.

Investigations were made of the stability of 5-chlorouracil in dilute aqueous solution when exposed to UV radiation equal to sunlight and to determine the rate and mechanism of the photolysis process. Photolytic reduction of 5-chlorouracil concentrations in natural waters vary with seasonal changes in the aquatic environment. Absorption of UV radiation by dissolved organic matter makes photolysis insignificant at depths greater than 1 m. A decrease in photolysis occurs during winter with low light and temperature, due to the lower pH associated with less photosynthetic activity, and due to lower incident UV levels and the shift in threshold photolysis pH with lower temperatures. Acidic conditions also inhibited photolysis during any combination of temperature and illumination. Photolytic decomposition of 5-chlorouracil is most significant in relatively shallow, clear, alkaline water bodies and less in acidic, colored, or turbid waters. It was suggested that the photolysis reaction observed was basically photohydrolysis. Though natural sunlight-induced photolysis reduces 5-chlorouracil concentrations added to natural waters by chlorination, usually the rate is not fast enough to significantly reduce the quantity added to the environment. Therefore, sunlight UV radiation cannot be counted upon to reduce environmental consequences of the introduction of 5-chlorouracil into natural waters. (Collins-FIRL)
W77-03477

TRANSFERABLE DRUG RESISTANCE ASSOCIATED WITH COLIFORMS ISOLATED FROM HOSPITAL AND DOMESTIC SEWAGE,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5A.
W77-03478

A STUDY OF SUBSTRATE REMOVAL IN A MICROBIAL FILM REACTOR,
Cape Town Univ. (South Africa). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-03480

HYGIENIC STANDARDIZATION OF THE CONTENT IN WATER OF MONOISOBUTYLAMINE AND DIISOBUTYLAMINE DURING THEIR COMBINED ACTION, (IN RUSSIAN),
Sanitaro-Gigienicheski Meditsinskii Institut, Leningrad (USSR).
M. N. Kuklina, and S. A. Zybbarova.
Gig Sanit 4, p 39-41, 1975.

Descriptors: *Organic compounds, Public health, Organic wastes, Water quality standards, Reactions, Lethal limit.
Identifiers: *Butylamines.

The combined action of mono- and diisobutylamine, which have the same limiting index of noxiousness, consists of a simple summation of the effect. (Experiments were conducted on rats and rabbits.) When jointly present in a water body, their content should not exceed 1/2 of the maximum permissible concentration. The simultaneous presence of mono- and diisobutylamine at this level does not cause a deterioration of the organoleptic properties of water, disturb natural purification processes nor have any toxic action. (The dynamics of saprophytic microflora were also studied.)—Copyright 1976, Biological Abstracts, Inc.
W77-03481

AEROSOL PRODUCTION BY IRRIGATION EQUIPMENT USED FOR LAND APPLICATION OF WASTE WATER,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 5A.
W77-03484

VARIATIONS OF COLIFORM BACTERIA AND OTHER POLLUTION INDICES IN SURFACE WATERS.

Public Health Service, Washington, D.C. Water Quality Section.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 541. Price codes: A02 in paper copy, A01 in microfiche. April 1965. 17 p, 5 fig, 2 ref.

Descriptors: *Waste water treatment, *Sedimentation rates, *Coliforms, *Suspended solids, Flocculation, Coagulation, Sewage bacteria, Effluents, Sedimentation, Suspended load, Waste disposal, Detergents, Phosphates, Nitrogen, Nutrients, Surface waters, New York, California.
Identifiers: *New York Harbor, Primary effluents, Secondary effluents, Differential sedimentation.

A 10% annual increase in coliform pollution in New York Harbor waters since the early 1950's—a period marked by continuing sewage treatment plant construction in the area—may have been a direct result of the improved treatment practice, as suggested by comparisons with data from other sources. Blame for the bacterial pollution was first assigned to an 'aftergrowth' of organisms in the receiving waters stimulated by nutrients such as phosphate or nitrogen compounds in secondary treatment effluent. But studies of marked coliform increases at five inland locations with improved waste treatment programs of relatively recent origin show that phosphate, detergent and other pollution parameters do not clearly correlate with coliform increases. However, examination of Los Angeles' Hyperion Treatment Plant and its effects on the waters of Santa Monica Bay suggest that New York Harbor's coliform problem is due to the changed behavior of suspended solids in the effluents. At Santa Monica Bay, suspended solids in primary effluent settled with a rate coefficient four times that for secondary effluent, and the coliforms associated with the solids were, of course, similarly affected. Analysis of this settling proclivity differential shows that such coliform increases may be expected when improved treatment, but not effluent chlorination, is provided. (Harris-Wisconsin)
W77-03539

SIMULATION OF PESTICIDE MOVEMENT ON SMALL AGRICULTURAL WATERSHEDS,
ESL, Inc., Sunnyvale, Calif.
R. T. Adams, and F. M. Kurisu.
Report No EPA-600/3-76-066, Ecological Research Series, September 1976. 342 p, 138 fig, 14 tab, 65 ref, 3 append. 68-01-0721, 68-01-2977.

Descriptors: *Path of pollutants, *Pesticide kinetics, *Soil physical properties, *Simulation analysis, Pesticides, Pesticide residues, Movement, Infiltration, Percolation, Volatility, Leaching, Adsorption, Persistence, Runoff, Evaporation, Soil profiles, Agriculture, Model studies, Degradation, *Agricultural watersheds, Mathematical models, Computer models.
Identifiers: *SCRAM, Sensitivity analysis.

A computer model, SCRAM, (Simulation of Contaminant Reactions and Movement) designed to predict the movement of pesticides from agricultural lands, is described and its predictive capability tested. SCRAM is composed of a number of deterministic submodels which describe infiltration, percolation, evaporation, runoff, sediment loss, pesticide adsorption and desorption in the soil profile, pesticide microbial degradation in the soil profile, and pesticide volatilization processes. SCRAM predictions of these physical processes were compared to experimental data from two small watersheds near Athens, Georgia. Simulation of surface runoff agreed reasonably well with experimental measurements, while sediment loss predictions did not. Predictions of pesticide loss in the runoff and on the sediment were in general

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

agreement with experimental data, after allowing for inaccurate sediment loss predictions. Tests of the model for pesticide movement in the soil profile indicated: (1) that some diphenamid was transported more rapidly below 5 centimeters, remained longer in the upper 5 centimeters, and degraded similarly to the experimental results; (2) initial atrazine movement into the soil was more rapid than predicted and its degradation was not in agreement; (3) simulated rates of pesticide removal from the soil surface was too rapid; and (4) simulated trifluralin volatilization losses were somewhat unsatisfactory, while its movement in the soil profile was in close agreement with experimental measurements. (Luedtke-Wisconsin) W77-03540

SIGNIFICANCE OF NITRATES IN DRINKING WATER, (IN RUSSIAN), Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR). L. L. Livshits, A. G. Kokina, and G. I. Lazjuk. Gig Sanit 5, p 103 104, 1975.

Descriptors: *Nitrates, *Potable water, *Water wells, Artesian wells, Water analysis, Water pollution, Cities, Groundwater, *Nitrogen, Soils, Rural areas. Identifiers: *Belorussian-Ssr, *USSR, Nitrate nitrogen, *Neonates.

The data of many investigators indicate the occurrence of methemoglobinemia in connection with the consumption of drinking water containing nitrates in quantities exceeding 10 mgN/l. An investigation of 1098 artesian and dug wells in all regions of the Belorussian SSR (USSR) revealed that the water of 80.27% of the wells contained nitrates in a quantity > 10 mg N/l. There was an inverse relation between the nitrate concentration and depth of the wells and a direct relation between the nitrate content in the well water and amount of precipitation, which indicated that the nitrate concentration in well water reflects the effect of the degree of soil pollution of the investigated rural areas. A study of 27,383 histories of urban and rural neonates did not reveal significant differences in the proportion of neonates with congenital defects of fetal development among rural inhabitants in comparison with urban. A comparison of the number of term neonates with a relatively low weight (up to 3.5 kg) in urban and rural locales did not reveal significant differences. A high content of nitrate N in groundwaters is not considered one of the factors promoting fetal antenatal hypotrophy.—Copyright 1976, Biological Abstracts, Inc. W77-03541

A MODEL FOR THE CONTROL OF DISSOLVED MANGANESE IN THE INTERSTITIAL WATERS OF CHESAPEAKE BAY, Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences. G. R. Holdren, O. P. Bricker, and G. Matisoff. Available from the National Technical Information Service, Springfield, VA 22161 as COO-327 919, Price codes: A02 in paper copy, A01 in microfiche. Report CONF-750410-8, (1975). 18 p. 6 fig., 1 tab., 33 ref. AEC AT(11-1)-3292.

Descriptors: *Chesapeake Bay, *Model studies, *Manganese, *Pore water, Inlets(Waterways), Estuaries, Interstices, Subsurface waters, Chemical properties, Ionization, Acidity, Sediments, Bottom sediments, Diagenesis, Path of pollutants, Distribution. Identifiers: *Dissolved manganese.

A model is described which predicts dissolved manganese distribution in the anoxic pore waters of the sediments of Chesapeake Bay, where greater concentrations of the metal have been found than in any other marine or brackish water sediment system. The model was developed from observations on the pore water composition and

describes the results of two independent competing reactions. Both reactions are continuous over the whole sediment column, and the final calculated concentration of dissolved manganese at any particular depth is dictated by the process most limiting the concentration at that depth. The model requires knowledge of the acidity of the pore waters, the distribution of bicarbonate ion with depth in the sediment, the amount of manganese oxide in the surface sediment and the rate of release of manganous ion from those solids. In the model, the diffusion coefficient and sedimentation rates were assumed as constant through space and time, respectively, and it was assumed that steady state has been reached in the system and that with depth in the core manganous ion was in equilibrium with a poorly-crystalline carbonate phase. Agreement is generally good between the model and the field data, suggesting that the processes controlling the distribution of dissolved manganese in the bay sediments are basically understood. (Harris-Wisconsin) W77-03556

THE IMPACT OF INTENSIVE APPLICATION OF PESTICIDES AND FERTILIZERS ON UNDERGROUND WATER RECHARGE AREAS WHICH MAY CONTRIBUTE TO DRINKING WATER PROBLEMS, Environmental Protection Agency, Washington, D.C. Office of Toxic Substances. D. Garrett, F. P. Maxey, and H. Katz. Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 181, Price codes: A06 in paper copy, A01 in microfiche. January, 1976. 110 p, 12 fig, 6 tab, 103 ref. Technical Report No. EPA 560/3-75-006.

Descriptors: *Water pollution, *Groundwater recharge, *Farms, *Fertilizers, *Pesticides, Waste disposal, Septic tanks, Cesspools, Soil types, Soil water movement, Potable water, Groundwater, Nitrates, Nitrification, Denitrification, Chemical wastes, Farm wastes, Nitrogen compounds, Path of pollutants.

An assessment of the impact of intensive application of pesticides and fertilizers on underground water recharge areas is presented, with particular emphasis on agricultural feedlot operations. Pesticides appear to offer only a marginal threat to groundwater quality because of their adsorptive properties in the soil structure and/or their short-lived persistence. Exceptions to this include the improper application of pesticides or the existence of sandy soils or thin soils overlaying fissured rocks. With regard to fertilizer application, more information on the amount of nitrate reaching the groundwater is required. Septic tanks on farms present an insignificant source of pollution to groundwater in terms of public drinking water supplies. However, well water supplies on a particular farm may be susceptible to contamination from septic tanks. Cesspools represent a significantly greater groundwater pollution source, although such installations are now widely prohibited. More information on the processes of nitrification and denitrification in various soils and subsoils as a function of soil temperature, climate, and biochemistry is needed in relation to animal waste applications and fertilizer and crop cover sources of nitrogen. (Kreager-FIRL) W77-03567

EXPERIMENTAL SUBSTANTIATION OF THE MAXIMAL PERMISSIBLE CONCENTRATIONS OF TRIETHANOLAMINE, AMMONIUM AND CALCIUM SALTS OF ALKYL-BENZOSULFATES IN WATER BODIES, (IN RUSSIAN), Nauchno-Issledovatel'skii Institut Epidemiologii i Mikrobiologii, Lvov (USSR). V. Y. Kordonets. Gig Sanit 3, p 22-25, 1975.

Descriptors: *Organic compounds, Organoleptic properties, *Lethal limit, *Water quality standards, Water pollution, Chemical wastes, Salts, Toxicity, Calcium, Ammonium. Identifiers: *Alkylbenzolsulfates, Calcium salts, Ammonium salts, *Ethanolamine.

Triethanolamine, ammonium and calcium salts of alkylbenzolsulfonic acids have unfavorable effects on the organoleptic properties of water and the sanitary regimen of water bodies. The compounds are of low toxicity, their cumulative properties are insignificant and they have a polytropic effect on warm-blooded animals. The no toxicity levels of triethanolamine, ammonium and calcium salts of alkylbenzolsulfates in the water comprise 1, 0.8 and 0.2 mg/l, respectively. Rats and mice were studied.—Copyright 1976, Biological Abstracts, Inc. W77-03586

5C. Effects Of Pollution

DISTRIBUTION OF PELAGIC ZOOPLANKTON WITHIN A THERMAL GRADIENT IN LAKE COLUMBIA, A COOLING LAKE NEAR PORTAGE, WISCONSIN, Wisconsin Univ., Madison. Lab., of Limnology. R. M. Villwock. Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 220, Price codes: A03 in paper copy, A01 in microfiche. Honors Degree Report for B.A. in Zoology, May 1976. 44 p, 9 fig, 4 tab, 13 ref. OWRT A-070-WIS(2). 14-34-0001-6052.

Descriptors: Spatial distribution, *Thermal pollution, *Cooling water, Management, *Trophic level, Biological communities, *Wisconsin, *Zooplankton, *Distribution, *Thermal properties, Lakes, Water pollution effects. Identifiers: *Lake Columbia(Wisc), Lake Wingra(Wisc), *Pelagic zooplankton, Cooling lakes, Vertical distribution.

Zooplankton samples showed that pelagic zooplankton were non-randomly distributed in both the vertical and horizontal planes of Lake Columbia, Wisconsin. These distributions as a function of temperature within a thermal gradient are described. Lake Columbia is an artificial, 194 hectare (480 acre), U-shaped cooling lake whose waters undergo a 10 to 15 degree centigrade temperature increase when pumped as coolant through a 527 megawatt fossil fuel power plant. A comparison of seasonal abundance data for zooplankton species of Lake Columbia with the same species of Lake Wingra, a suitable reference lake also in southern Wisconsin, indicated that the Lake Columbia zooplankton seasonal abundance was altered by the thermal environment. Lake Columbia experienced temperatures in excess of 44 degrees centigrade in mid-summer months; during these months zooplankton were rare or absent. Lake Wingra data do not contain any summer temperatures exceeding 30 degrees centigrade nor any total zooplankton population levels of less than 10 to 20 organisms per liter. Lake Columbia zooplankton levels were highest in November with plant outfall counts of 600 organisms per liter. Entrapment concentrated zooplankton at the plant outfall and at the outfall of the pumping system which maintains lake level. Vertical distribution of zooplankton were affected more by negative phototropism and wind mixing of Lake Columbia than by thermal stratification. W77-03077

DISTRIBUTION AND FEEDING OF PUMPKIN-SEED (LEPOMIS GIBBOSUS) AND BLACK CRAPPIE (POMOXIS NIGROMACULATUS) IN A POWER PLANT COOLING LAKE, Wisconsin Univ., Madison. Lab. of Limnology. G. Kromrey.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 219, Price codes: A03 in paper copy, A01 in microfiche. M.S. Thesis, May 25, 1976. 19 p., 11 tab, 11 fig, 13 ref. OWRT A-070-WIS(1). 14-31-0001-6052.

Descriptors: *Water cooling, Management, Limnology, Biological properties, Biological communities, Ecosystems, *Distribution, *Thermal pollution, *Thermal properties, Fish diets, Fish behavior, Fish food organisms, *Sunfishes, Lakes, *Wisconsin, Water pollution effects. Identifiers: *Lake Columbia(Wisc), *Black crappie, *Pumpkinseed(Fish).

The distribution, feeding, movements, and condition of pumpkinseeds (*Lepomis gibbosus*) and black crappie (*Pomoxis nigromaculatus*) along the horizontal thermal gradient of Lake Columbia were examined during the autumn of 1975. Distribution and condition data were obtained by capturing fish with fyke nets stratified by temperature. Fish feeding habits were determined by stomach content analysis. Evidence of fish movement was sought by comparing known macroinvertebrate and zooplankton distributions to fish stomach analysis. Results indicate that the fish were not aggregating at their preferred temperature. Small black crappie ate macroinvertebrates, chiefly chironomids and Coenis, and zooplankton. Large black crappie ate *Lepomis* juveniles and macroinvertebrates. Pumpkinseeds ate mostly chironomids and some *Caenis* and zooplankton. The food of the fishes corresponded to the differing relative abundances of food organisms monitored in the vicinity of a particular catch point, indicating that fish on a daily basis were not swimming extensive linear distances. Both species were in above average condition at all points along the thermal gradient. W77-03078

SURF-ZONE WATER QUALITY IN LIVERPOOL BAY,
Lancaster Univ., Bailrigg (England). Lancashire and Western Sea Fisheries Joint Committee.
For primary bibliographic entry see Field 5B. W77-03092

COASTAL REGION RESIDENCE TIME ESTIMATES FROM CONCENTRATION GRADIENTS,
Ontario Ministry of the Environment, Toronto.
M. D. Palmer.
Journal of Great Lakes Research, Vol. 1, No. 1, p 130-141, October 1975. 8 fig, 3 tab, 11 ref.

Descriptors: *Great Lakes, *Water pollution effects, *Coasts, *Trophic level, *Lakes, Water quality, Mass transfer, Boundary processes, Analytical techniques, Surveys, Waste water(Pollution), Phosphorus, Chlorophyll, *Canada, *Path of pollutants, *Lake Superior. Identifiers: *Residence time, *Concentration gradients, *Thunder Bay(Ontario).

A method for estimating the annual mean mass exchange of dissolved solids (as measured by conductivity) and total phosphorus between coastal and offshore waters was discussed. This estimate was evolved from concentration contours, water volumes, and loadings using two assumptions: (1) groundwater exchange and atmospheric loadings are negligible compared to other loadings, and (2) evaporation and precipitation are approximately equal. The annual mean mass exchange for the nearly conservative substance (dissolved solids) was evaluated from the continuity equation using loading figures and the concentration contours for conductivity. A coastal residence time was estimated for conductivity. The coastal residence time was defined as the volume of the substance contained in the coastal region divided by the mass exchanges for steady state. A similar technique was used for total phosphorus with the mass lost to sedimentation determined by assuming that the

coastal residence times for the dissolved solids and total phosphorus are similar. From the residence times, total phosphorus loadings, and details of the coastal region, it was possible to estimate the trophic state. The method was applied to surveys in the Thunder Bay region where the coastal region residence time was found to be 40 days and 40% of the discharged total phosphorus being lost to uptake sedimentation. The trophic state at the shallow nearshore region was found to be more eutrophic than the deeper, farther offshore regions. (Humphreys-ISWS) W77-03093

IMPACTS OF THE DEPOSITION OF DREDGED SPOILS ON LAKE ERIE SEDIMENT QUALITY AND ASSOCIATE BIOTA,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
R. Sweeney, R. Foley, C. Merckel, and R. Wyeth.
Journal of Great Lakes Research, Vol. 1, No. 1, p 162-170, October 1975. 1 fig, 3 tab, 28 ref.

Descriptors: *Lake Erie, *Spoil banks, *Dredging, *Water quality, Water pollution effects, On-site investigations, On-site data collections, Sediments, Water analysis, Biota, Benthic fauna, Oligochaetes, Nematodes, Heavy metals, Nitrogen, *Lake sediments, Nutrients, Water pollution sources.

Sediment samples were collected during June, August, and November, 1973 from 25 equally spaced stations over an area of nearly 64 sq km, the center of which was approximately 12 km north of Cleveland, Ohio. Within this zone was a United States Corps of Engineers 16.5 sq km dump site in which more than 18,960,000 cu m of dredgings from Cleveland Harbor and the Cuyahoga River had been deposited between approximately 1925 and 1968. Seven of the above stations were situated in this former dump site. Simultaneous collections were made at 25 equally spaced stations in a 64 sq km area situated southwest and adjacent to the region described above. The latter area had not been used as a dump site. Sediment gathered with Ponar dredges was analyzed for BOD, COD, phosphates (soluble and total), nitrogen (nitrates, ammonium, organic and total), oils and greases, chlorine demand, and heavy metals (mercury, iron, cadmium and chromium). In addition, quantitative and qualitative analyses for benthic macroinvertebrates were conducted. The concentrations of nutrients (phosphorus and nitrogen), toxicants (heavy metals), and pollutants (as indicated by chlorine demand, BOD, COD and oils and greases measurements) in the surface sediments generally were higher in the dump site than in the surrounding sediments. With regard to benthic macroinvertebrates, the lowest species diversity indexes and a highest oligochaete-to-total organism ratio generally were observed in the former spoils deposition region. It was concluded that the quality of the benthic environment was degraded by past dredging disposal practices. (Humphreys-ISWS) W77-03094

PERMISSIBLE LEVEL OF BENZO(A)PYRENE IN WATER BODIES, (IN RUSSIAN),
Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).
For primary bibliographic entry see Field 5B. W77-03117

EFFECTS OF POTASSIUM ON ADULT ASIATIC CLAMS, CORBICULA MANILENSIS,
Illinois Natural History Survey, Urbana.
K. B. Anderson, C. M. Thompson, R. E. Sparks, and A. A. Paparo.
Biological Notes No. 98, Illinois Natural History Survey, Dept. of Reg. and Ed., Natural History Div., Urbana, July 1976. 7 p, 3 fig, 12 ref. OWRT B-097-ILL(1). 14-31-0001-6072.

Descriptors: *Clams, Aquatic environment, Mollusks, *Potassium, *Ions, Metals. Identifiers: Mollusk control, *Metal ions, *Asiatic clams, Molluscicides.

Preliminary research results indicate that the use of metal ions, particularly potassium, alone or in conjunction with a molluscicide may possibly control the troublesome Asiatic clam population *Corbicula manilensis* without damaging other organisms in the surrounding environment, if used cautiously and selectively. These conclusions were reached after testing the sublethal and lethal effects of potassium concentrations on the clam under laboratory conditions. The results indicated that potassium acts quickly to produce sublethal effects (foot immobilization and gaping); both effects were produced within 48 hours with the threshold concentration of potassium for foot immobilization being 120 mg per liter of water and for gaping 190 mg/liter. For a 96-hour period, a concentration of 225 mg/liter was lethal to 50% of all the test organisms. The investigators, in presenting their data and their discussion, recommend further research. W77-03119

LITTER AND OIL ON THE SHORES OF UT-SIRA, ROGALAND COUNTY, DURING AUTUMN 1974, (IN DANISH),
For primary bibliographic entry see Field 5B. W77-03125

BIOGEOCHEMICAL DEVELOPMENT OF THE LAKE OF GENEVA (SWITZERLAND) FROM 1957 TO 1973: PART III, (IN FRENCH),
Paris Univ., Thonon-les-Bains (France). Center for Geodynamic Research.
B. Chassaing, P. Olive, J. P. Pelletier, and E. Siwertz.
Arch Sci (Geneva) 28(2), p 203-215, 1975.

Descriptors: *Bacteria, *Entrophication, *Geochemistry, Classification, Ecology, Zooplankton, Fungi, Phytoplankton, Lakes, Benthos, Fish, Cyanophyta. Identifiers: Aphanizomenon-Flos-Aquae, Oscillatoria-Rubescens, Rhodomonas-Minuta, Stephanodiscus-Hantzschii, *Switzerland, *Lake of Geneva(Switzerland).

The living organisms in a lake are classified according to their ecologic role, as producers (chlorophyll bearing organisms), consumers (zooplankton, benthos and fishes) and decomposers (lower fungi, bacteria). The phytoplankton includes permanent species, such as *Rhodomonas minuta* and seasonal species like *Stephanodiscus hantzschii*, which develops explosively in spring. Occasional species include *Oscillatoria rubescens* and other Cyanophyceae (*Aphanizomenon flos-aquae*).—Copyright 1976, Biological Abstracts, Inc. W77-03144

PLANKTON OF COASTAL LAGOONS: XI. TRANSPORT IN THREE ESTUARIES OF THE NORTHWEST OF MEXICO (NOVEMBER, 1973) (IN SPANISH),
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Biologia.
For primary bibliographic entry see Field 2L. W77-03145

EXPERIMENTAL STUDIES ON THE SECOND INTERMEDIATE HOSTS OF CLONORCHIS SINENSIS: III. OBSERVATIONS ON THE RELATIONSHIP BETWEEN CLAVATE CELLS OF EPIDERMIS AND INFECTIVITY OF METACERCARIAE OF CLONORCHIS SINENSIS IN FRESHWATER FISH, (IN KOREAN),
J. K. Rhee.
Korean J Parasitol 12(2); p 101-110, 1974.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

Descriptors: *Fish, *Systematics, Asia, *Fish diseases, Freshwater fish, Rivers, Carp, Pollutant identification, Water pollution effects, *Fish parasites.

Identifiers: *Acheilognathus*-Spp., *Anguilla*-*Japonica*, *Carassius*-*Carassius*, **Clonorchis*-*Sinensis*, *Cobitis*-*Taenia*, *Coreoleus*-*Splendius*, *Coreoperca*-*Herzi*, *Cultricus*-*Eigenmanni*, *Gnathopogon*-Spp., *Liobagrus*-*Mediadiosalis*, **Metacercariae*, *Microphysogobio*-*Koreensis*, *Misgurnus*-*Anguillicaudatus*, *Parasilurus*-*Asotus*, *Pelteobagrus*-*Fuluidraco*, *Pseudogobio*-*Esocinus*, *Pseudoperilampus*-Spp., *Pseudorasbora*-*Parva*, *Pungtungia*-*Herzi*, *Relationship*, *Sarcocheilichthys*-*Czerskii*, *Zacco*-*Platyus*, **Korea*, **Clavate* cells.

Epidermis samples from 26 spp. of fresh water fish from the main rivers of Korea were examined histologically. Generally the clavate cell had a simple nucleus at its center. In *Liobagrus mediadiosalis* and *Pelteobagrus fuluidraco* the clavate cell had 2 nuclei with and independent so-called light halo of Oxner and sometimes had none of them. In *Misgurnus anguillicaudatus*, *Cobitis taenia*, *L. mediadiosalis*, *P. fuluidraco*, *Parasilurus asotus* and *Anguilla japonica*, scales were not detected or were buried in the dermis layer, and the epidermis mostly consisted of clavate cells; no metacercariae were found. In *Cyprinus carpio*, *Carassius carassius* (crusian carp and golden crusian carp), *Sarcocheilichthys czerskii*, *Pungtungia herzi* and *Coreoleus splendius*, scales were exposed over the epidermis, in which clavate cells were abundant; a few metacercariae were detected. No clavate cells were observed in *Pseudorasbora parva*, *Zacco platypus*, *Microphysogobio koreensis*, *Gnathopogon majimai*, *G. Coreanus*, *Acheilognathus signifer*, *A. yamatsutae*, *Cultricus eigenmanni*, *Coreoperca herzi*, *Pseudoperilampus uvekii*, *P. notatus* or *Pseudogobio esocinus*. These fishes with exposed scales on the epidermis serve as 2nd intermediate hosts of *C. sinensis*. Clavate cell presence in the epidermis of the fresh water fish seems correlated with the infectivity of the metacercariae of *C. sinensis*.—Copyright 1976, Biological Abstracts, Inc. W77-03161

EFFECT OF ZINC-COATED CULVERTS ON VERTEBRATE AND INVERTEBRATE FAUNA IN SELECTED MAINE STREAMS,

Maine Univ., Orono, Dept. of Zoology.
R. W. Gregory, and J. Trial.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 344. Price codes: A02 in paper copy, A01 in microfiche. Maine Land and Water Resources Institute, Orono, Completion Report, September 1975. 18 p, 9 tab, 39 ref. OWRT A-033-ME(1).

Descriptors: Zinc, *Culverts, Heavy metals, Benthic fauna, *Toxicity, Trout, *Maine, Streams, *Corrosion, Invertebrates, Atlantic salmon, Water pollution effects.

Identifiers: *Zinc toxicity, Vertebrate avoidance threshold, Galvanized culverts corrosion, Invertebrate diversity, Spongilla sp.

The effect of zinc loss from galvanized culverts on vertebrate and invertebrate fauna was investigated. Methods of analysis included the Mann-Whitney test for zinc analysis, electrofishing, invertebrate collection with a Hess sampler, and use of Simpson's diversity index. Results indicate that corrosion of galvanized culverts significantly increases zinc concentrations in stream water, particularly in newer culverts, although culverts five to six years old also demonstrate significant zinc losses. Highest zinc concentrations were found during conditions of highest temperature (20C) and low flow. No adverse effects of increased zinc concentrations were documented for either fish distribution or invertebrate diversity or abundance, with the possible exception of *Spongilla*. However, levels of zinc are at times, above the avoidance threshold (0.05 ppm) of Atlantic sal-

mon, a particular concern in Maine. (Hutchins-Maine)
W77-03170

EFFECTS OF MERCURY AND COPPER ON THE OLFACTORY RESPONSE IN RAINBOW TROUT, SALMO GAIARDNERI,

Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
T. J. Hara, Y. M. C. Law, and S. MacDonald.
Journal of the Fisheries Research Board of Canada, Vol 33, No 7, p 1568-1573, July, 1976, 1 tab, 6 fig, 36 ref.

Descriptors: *Rainbow trout, *Mercury, *Copper, *Analytical techniques, Environmental effects, *Bioassay, *Fish physiology, *Bioindicators, *Fish behavior, Methodology, Heavy metals, Biochemistry, Trout.
Identifiers: *Olfactory response, *Olfactory sensitivity.

The effects of mercury and copper on the olfactory response of rainbow trout (*Salmo gairdneri*) were studied by perfusing HgCl₂ and CuSO₄ solutions through the olfactory organs while recording the olfactory bulbular electrical responses to the standard stimulant, L-serine. The olfactory response was depressed during exposure to mercury and copper. The lowest concentrations of mercury and copper needed to cause appreciable effects within 2 h were estimated at 0.10 and 0.008 mg/liter, respectively. The depression increased with increase in the concentration and exposure time of the heavy metals. Recovery of the olfactory response was slower with higher concentrations and longer exposure. The method is rapid, accurate, and sensitive, and can be applied to other toxic chemicals and fish species. (Katz)
W77-03184

MACOMA BALTHICA: AN INDICATOR OF OIL POLLUTION,

Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W77-03185

TOXICITY OF NO. 2 FUEL OIL TO COON STRIPE SHRIMP,

Battelle Pacific Northwest Labs., Sequim, Wash. Marine Research Labs.
J. R. Vanderhorst, C. I. Gibson, and L. J. Moore.
Marine Pollution Bulletin, Vol. 7, No. 6, June 1976, p. 106-108, 1 tab, 16 ref.

Descriptors: *Oil, *Oil spills, *Water pollution effects, Crustaceans, *Shrimp, *Toxicity, *Bioassay, Laboratory tests, Laboratory animals, Fuel, Marine pollution, Marine animals, *Marine fisheries.
Identifiers: No. 2 Fuel Oil, Coonstripe shrimp, Continuous flow bioassays, 96 hr L50, *Pandalus danae*.

Bioassay of a No. 2 fuel oil dispersion with shrimp in a continuous flow system using measured waterborne oil as the indicator of oil concentrations reveals a treatment more definable than those previously described in terms of volume ratios and produces lower lethal concentrations. Shrimp 96-h LC50 was 0.8 mg/l in this study as compared to values from 1.5 to 50 mg/l reported for other methods. Mean concentrations in tests do not give significant differences in concentration with respect to day of the test or spatial distribution in the exposure tanks. (Katz)
W77-03186

EFFECTS OF OIL POLLUTION ON BREEDING GREY SEALS,

West Wales Naturalist Trust, Haverfordwest (England).
J. E. Davis, and S. S. Anderson.
Marine Pollution Bulletin, Vol. 7 (6), June 1976, p. 115-118, 5 tab, 1 fig, 10 ref.

Descriptors: *Oil, *Oil pollution, *Water pollution effects, Oil spills, Mammals, *Marine animal, Marine biology, Mortality, Growth rates, *Animal behavior, Environment, Social aspects, *Reproduction, Water pollution sources, Oil wastes.

Identifiers: *Seals, *Grey seals, Wales, *Seal pups, Mothers, *Oiled seals, *Survival of seal pups.

Marine mammals are probably frequently exposed to floating oil but little is known about the effect oil pollution has on them. Oil stranded on the shore in Pembrokeshire, West Wales in September 1974 coincided with the start of the Grey Seal breeding season there. Observations have been made on the effect the oil had on the new born pups and their mothers. Behavior of oiled seals did not appear to differ from that of normal seals. Peak weights of oiled pups were significantly lower than those of un-oiled pups but there is little point of cleaning individual animals. (Katz)
W77-03187

IMMEDIATE INDUSTRIAL EFFECTS ON SEDIMENT MERCURY CONCENTRATIONS IN A CLEAN COASTAL ENVIRONMENT,

Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W77-03188

THE EFFECT OF DETERGENTS ON LARVAL DEVELOPMENT OF A CRAB,

K. Czerwaska.
Marine Pollution Bulletin, Vol. 7, No. 6, June 1976, p. 108-112, 7 tab, 1 fig, 20 ref.

Descriptors: **Crustaceans, Aquatic animals, *Crabs, *Commercial shellfish, *Toxicity, *Bioassay, Laboratory animals, Larvae, Reproduction, *Synthetic detergents, Water pollution, Water pollution sources, Marine fish.
Identifiers: Larval development, Anionic detergents, Non-ionic detergents, Ethoxylate detergents, *Alkylate detergents, Crab larvae, *Rhithropanopeus*, Larval mortality, Detergent mixtures.

The effect of a mixture of anionic (ethoxylate) and non-ionic (alkylate) detergents on developmental stages of the crab *Rhithropanopeus* from final embryogenesis to the Megalopa larval stage has been studied. Larval resistance increases with age. Larvae still in the eggshells are only slightly sensitive because of the thick and impermeable chorion. Low concentrations of detergents exert a favourable effect, causing a decrease in larval mortality, but during moults there is an increasing mortality and a lengthening of the developmental period of the larvae. The mixture of detergents is more toxic than single detergents. (Katz)
W77-03189

EFFECTS OF OIL ON BEACHES IN WEST CORK, IRELAND,

University Coll., Cork (Ireland). Dept. of Botany
J. P. Cullinane, and P. M. Whelan.
Marine Pollution Bulletin, Vol. 7, No. 4, April 1976, p. 72-73, 1 ref.

Descriptors: *Oil, *Oil spills, Water pollution effects, Water pollution sources, Algae, *Marine algae, *Mortality, Mode of action, Benthic animals, *Barnacles, *Seaweeds, Beaches, Recreation facilities.
Identifiers: *Ireland, *Oil lumps, *Lichens, *Goose barnacles, Congealed oil, West Cork (Ireland).

Large lumps of congealed oil, probably tanker ballast, were washed ashore on beaches of the South Coast of Ireland. Effects of the oil on seaweeds and barnacles are described. (Katz)
W77-03192

INFLUENCE OF ILLUMINATION ON PHYTOTOXICITY OF CRUDE OIL.

Museum National d'Histoire Naturelle, Paris (France). Laboratoire de Physiologie Generale et Comparee.
J. C. LaCaze, and O. Villedon de Naide.
Marine Pollution Bulletin Vol. 7 (4), April 1976, p. 73-76.

Descriptors: *Oil, *Oil spills, Water pollution effects, Oil wastes, Water pollution sources, Disasters, Oil waters, Algae, *Marine algae, *Marine plankton, *Toxicity, Mortality, Biodegradation, Plant physiology, Mode of action, *Phytotoxicity, Phytoplankton, *Detergent.
Identifiers: Kuwait crude oil, Microalgae, *Phaeodactylum tricornutum*, Marine phytoplankton, *Chemical dispersant, Corexit 8666.

Petroleum products discharged at the water surface are rapidly modified under the effect of physico-chemical and biological transformations, themselves closely dependent on ecological factors. The role of some of these, such as illumination, may be particularly significant. This report deals with the effect of this parameter on the phytotoxicity of Kuwait crude oil on the primary production of a microalga (*Phaeodactylum tricornutum*) and marine plankton communities. The result of these investigations indicates that the toxicity of extracts made from a crude oil is about two to three times greater when the latter is previously subjected to illumination of sufficient intensity and duration. The incorporation of a chemical dispersant (Corexit 8666) magnifies this phenomenon. In the case of a weathered crude oil mixed in equal parts with the dispersant, illumination raises the toxicity of the extracts by a factor of about 30. (Katz)
W77-03193

THE EFFECT OF OIL POLLUTION IN BANTRY BAY.

University Coll., Cork (Ireland). Dept. of Botany.
J. P. Cullinane, P. McCarthy, and A. Fletcher.
Marine Pollution Bulletin, Vol. 6, No. 11, November 1975, p. 173-176, 2 tab, 1 fig, 5 ref.

Descriptors: Oil, *Oil spills, Water pollution effects, *Oil wastes, Water pollution sources, Disasters, Oil waters, Atlantic Ocean, Algae, *Marine algae, *Kelps, Periphyton, *Lichens, Pathology, *Detergents.
Identifiers: *Biological damage, Bantry Bay (Ireland), Seaweeds, *Crude oil spill, Damage to vegetation, *Damage to lichens, Clean-up effects, Detergent effects, BP 1100X, Alkaline chlorinated detergent, *Ireland.

The biological damage caused by the large oil spill in Bantry Bay and the clean-up measures adopted to deal with it has been followed up in the months following the oil spill. This report refers to damage to algae and lichens. (Katz)
W77-03194

OLYMPIC ALLIANCE OIL SPILLAGE.

Oil Pollution South East Kent, Dover (England).
T. J. Dixon, and T. R. Dixon.
Marine Pollution Bulletin, Vol. 7 (5), May 1976, p. 86-90, 3 tab, 4 fig, 12 ref.

Descriptors: *Oil, *Oil spills, Water pollution effects, *Oil wastes, *Water pollution sources, Disasters, *Oil waters, Atlantic Ocean, Birds, Water birds, Gulls, Mortalities, Gulls.
Identifiers: Olympic Alliance Oil Spill, Strait of Dover, Ship collision, English coastline, Clearance organization, Oil clearance methods, Cormorants, Eider, Coot, Kittiwake, Razorbill, Guillemot, Oiled birds.

Despite the 1967 traffic separation scheme for the Straits of Dover another loaded tanker was damaged in a Channel collision. On this occasion approximately 2000-3000 tons of oil were spilt and

despite extensive and rapid measures to disperse it at sea, the English coastline was again affected. Oil clearance organization and methods were described, the estimates of the numbers and species of oiled sea birds are given. (Katz)
W77-03195

TOXICITY OF CRUDE OILS AND A DISPERSANT TO THE STONY CORAL MADRACIS MIRABILIS.

Caraibisch Marien-Biologisch Instituut, Curacao (Netherlands, Antilles).
J. H. B. W. Elgershuizen, and H. A. M. de Kruijf.
Marine Pollution Bulletin, Vol. 7(2), February 1976, p. 22-23.

Descriptors: *Oil wastes, *Oil pollution, Water pollution, *Benthic fauna, Coral, Invertebrates, *Marine animals, Atolls, Reefs, Detergents, Tropical regions, *Toxicity, Mortality, Bioassay.
Identifiers: Stony coral, *Madracis mirabilis*, Coral reefs, Dispersant, Leeward Islands, Chemical oil spill removers, Shell-dispersant LTX, Crude oil, Nigerian crude oil, Forcados crude oil, Tia Juana Pesada crude oil.

Coral reefs play a crucial role in the ecology of coastal tropical waters. In many areas they are now exposed to pollution hazards which have sometimes caused severe damage. Increasingly they are exposed to oil and, where clean-up methods are used, to dispersants. This report shows that the clean-up may be more damaging than the oil. (Katz)
W77-03196

EFFECTS OF CRUDE OIL ON AMERICAN LOBSTER (HOMARUS AMERICANUS) LARVAE IN THE LABORATORY.

Guelph Univ. (Ontario). Dept. of Zoology.
P. G. Wells, and J. B. Sprague.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 6, p. 1604-1614, 1976. 1 tab., 5 fig., 57 ref.

Descriptors: *Oil wastes, *Water pollution effects, *Lobster, *Larval growth stage, *Shellfish, *Lethal limit, *Toxicity, *Bioassay, *Larval, *Oily water, *Oil pollution, Animal behavior, Growth rates, Growth stages, Laboratory tests, Mortality, Commercial shellfish, Invertebrates, Methodology.
Identifiers: *Sublethal effects.

Four day LC50's for Venezuelan Tia Juana crude oil were 0.86 mg/liter for first-stage larvae of the American Lobster (*Homarus americanus*) and 4.9 mg/liter for third- and fourth-stage larvae. The 30-day LC50 was 0.14 mg/liter for larvae starting the test in their first stage. The threshold for retardation of larval development was about the same as the 30-day LC50. Decreased food consumption was demonstrated at 0.19 mg/liter. More 'intermediate' larvae developed in oil exposures but no threshold was estimated. The ratio of 'safe' to acutely lethal concentrations was about 0.03. Oil concentrations decreased during exposures; stated values could be multiplied by 0.59 to arrive at conventional average exposures. Aged dispersants were equally toxic. Post-larval lobsters dug significantly more burrows when the substrate contained oil but did not avoid oiled substrate, nor was growth or survival affected for substrates containing up to 1740 mg/liter of oil. (Katz)
W77-03197

EFFECTS ON FERTILIZATION AND DEVELOPMENT OF THE COMMON MUSSEL, MYTILUS EDULIS AFTER LONG-TERM EXPOSURE TO A NONIONIC SURFACTANT.

Kristinebergs Zoologiska Station (Sweden).
A. Granmo, and G. Jorgensen.
Marine Biology, Vol. 33, No. 1, p. 17-20, 1975. 2 fig., 8 ref.

Descriptors: *Mussels, *Surfactants, *Reproductions, *Water pollution effects, *Spawning, *Larval growth stage, *Larvae, Detergents, Environmental effects, Animal physiology, Invertebrates, Shellfish, Laboratory tests, Lethal limit.
Identifiers: *Sublethal effects.

Common mussels (*Mytilus edulis* L.) were exposed over a 5-month period to low-level concentrations (0.5 to 1.5 ppm) of a nonionic surfactant. Upon maturation at the end of this period, spawning ability was examined. Fertilization occurred at low-level concentrations (0.1 to 2.0 ppm) of the surfactant, and was most successful for gametes from the long-term controls and the highest long-term concentration (1.5 ppm). Inhibited or delayed larval development was observed, related to the concentration gradient of the short-term exposures. Gametes from mussels long-term exposed to the surfactant were more sensitive than those from the longterm control. (Katz)
W77-03198

DESTRUCTIVE GRAZING OF KELP BY SEA URCHINS IN EASTERN CANADA.

Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
P. A. Breen, and K. H. Mann.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 6, p. 1278-1283, June, 1976. 4 fig., 28 ref.

Descriptors: *Biological communities, *Food chains, *Kelps, *Primary productivity, *Algae, *Habitats, *Aquatic populations, *Plant populations, Aquatic plants, Crustaceans, Aquatic populations, On-site data collection, *Canada, Bays.
Identifiers: *Sea urchins, Laminaria, *St. Margaret's Bay (Nova Scotia).

Destruction of kelp beds by sea urchins has been documented in St. Margaret's Bay, Nova Scotia, and also appears to be taking place in other parts of eastern Canada. Continued sea urchin settlement onto grazed areas prevents the return of kelp and other algae for long periods. Because of the large contribution of kelp beds to coastal productivity, the disappearance of kelp from large areas is alarming. Dynamics of sea urchin grazing are discussed. (Katz)
W77-03199

PHYTOPLANKTON ECOLOGY IN VALPARAISO BAY: III. PHYTOPLANKTON FROM 1972-73, (IN SPANISH).

Chile Univ., Valparaiso. Departamento de Oceanologia.
S. Avaria, and E. Orellana.
Rev Biol Mar 15(3), p 207-226, 1975.

Descriptors: Biomass, South America, Bays, *Phytoplankton, Ecology, Distribution.
Identifiers: *Chile, *Valparaiso Bay (Chile), Vertical distribution.

An analysis of the phytoplankton from the surface to 30 m depth was made between April 1972 and April 1973. Approximately (Chile), weekly samples were taken in the same station, 2 miles from the shore off Renaca beach, in Valparaiso Bay for a total of 252 samples. General aspects of annual cycle, biomass evaluation, specific composition, population structure and vertical distribution are discussed.—Copyright 1976, Biological Abstracts, Inc.
W77-03200

ECOLOGY OF AQUATIC SAPROPHYTIC PHYCOMYCETES. II. (IN RUSSIAN).

Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
N. Ya. Artemchuk.
Mikol Fitopatol 9(2), p 89-91, 1975.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

Descriptors: *Ecology, *Salinity, *Temperature, *Carbon, Water pollution effects.
Identifiers: Saprophytic phycocyanes, *Organic carbon.

Data are presented on the distribution of aquatic saprophytic phycocyanes in relation to the ecological factors affecting their settlement: salinity, temperature and content of organic C in water. -Copyright 1976, Biological Abstracts, Inc. W77-03201

EFFECT OF COPPER ON SOME ASPECTS OF THE BIOENERGETICS OF RAINBOW TROUT (SALMO GAIRDNERI).
Guelph Univ. (Ontario). Dept. of Zoology. P. F. Lett, G. J. Farmer, and F. W. H. Beamish. Journal of the Fisheries Research Board of Canada, Vol. 33, No. 6, p. 1335-1342, June, 1976. 4 fig. 2 tab., 22 ref.

Descriptors: *Copper, *Water pollution effects, *Growth rates, *Stress, *Rainbow trout, *Feeding rates, *Adaptation, *Heavy metals, *Digestion, Laboratory tests, Bioassay, Environmental effects, Trout, Diets, Fish physiology, Metabolism, Lethal limit.
Identifiers: *Sublethal effects.

The influence of sublethal concentrations of total copper on the appetite, growth, and proximate body composition of rainbow trout (*Salmo gairdneri*) held in hard water (365 mg/liter) was measured over a 40-day interval. The initial response of trout exposed to concentrations of copper ranging from 0.0 to 0.3 mg/liter (the 96-h LC50 was 0.25-0.68) was the cessation of feeding. Thereafter, food intake gradually returned to amounts observed for control fish, the rate of return of appetite being dependent on copper concentration and ration level. Growth rate of trout exposed to copper (0.075-0.225 mg/liter) and fed rations of either 0.25 or 1.5% dry food wt/wet fish wt per day was initially depressed but approached values observed for control fish near the end of the 40-day interval. During this period, lipid, protein, and moisture of fish exposed to copper did not change significantly. Initial growth retardation was not attributable to the inability of copper-exposed fish to digest their daily rations. Results are discussed in terms of the ability of fish to adapt to stress imposed by sublethal concentrations of heavy metals. (Katz)
W77-03203

EFFECTS OF CHRONIC DDT/DDE EXPOSURE ON ANESTHETIC INDUCTION AND RECOVERY TIMES IN RAINBOW TROUT (SALMO GAIRDNERI).
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst. J. F. Klavertkamp, W. L. Lockhar, D. Metner, and N. Grift. Journal of the Fisheries Research Board of Canada, Vol. 33, No. 6, p. 1331-1334, June, 1976. 2 fig., 30 ref.

Descriptors: *Water pollution effects, *DDT, *DDE, *Bioassay, *Rainbow trout, *Mode of action, Animal physiology, Trout, Metabolism, Laboratory tests, Chlorinated hydrocarbon pesticides, *Lethal limit.
Identifiers: *Sublethal effects, *Phenoxethanol, *M.S.222, *Anesthetics, *Chemical interactions.

In rainbow trout (*Salmo gairdneri*) fed pellets containing 4.55 microgram/gr of DDT and 6.81 microgram/gr DDE every other day, anesthetic induction and recovery times of phenoxethanol (PE) were less than those in control fish. No interactions were observed in fish fed DDT/DDE and anesthetized with ethyl m-aminobenzoate methanesulphonate (M.S.222). Differences observed between fish fed DDT/DDE and anesthetized with PE as compared to M.S.222 could be due either to enhanced metabolism of PE

or to the fact that PE and M.S.222 have different modes or sites of action. (Katz)
W77-03204

EFFECT OF TEMPERATURE AND SALINITY ON EXTENSION OF SIPHONS BY MERCENARIA MERCENARIA.
Oak Ridge National Lab., Tenn. Environmental Sciences Div. W. VanWinkle, S. Y. Feng, and H. H. Haskin. Journal of the Fisheries Research Board of Canada, Vol. 33, No. 7, p. 1540-1546, July, 1976. 3 tab., 4 fig., 9 ref.

Descriptors: Environmental effects, *Temperature, *Salinity, *Clams, *Commercial shellfish, *Water temperature, *Animal behavior, *Animal physiology, Analytical techniques, *Respiration, Invertebrates, Molluscs, Laboratory tests, Seasonal, Bioassay, Crustaceans, *Siphons. Identifiers: Quahog clams.

Extension of siphons was used as a criterion of activity to examine the response of the quahog clam, *Mercenaria mercenaria*, to various combinations of test and acclimation temperatures and salinities. A quadratic regression model for the percentage of clams active as a function of the test temperature and salinity was assumed, and response surface contours for various percentages of activity were calculated and plotted. The regression model accounted for 72-88% of the observed variability in the 13 experiments considered. The contours are hyperbolic instead of elliptical for five of the experiments; no biologically meaningful estimates of the lower and upper temperature and salinity limits can be obtained in such cases. Low levels of activity, even at optimal T-S combinations, occurred during the summer. Some of the observed shifts in the position and shape of the temperature-salinity response surfaces were expected in light shifts in acclimation temperature or salinity. Other shifts in response surface could not be accounted for. The implications of these results for the purification of quahog clams harvested from polluted waters are discussed. (Katz)
W77-03205

HEAVY METALS IN LAKES OF THE COEUR D'ALENE RIVER VALLEY, IDAHO.
Idaho Univ., Moscow. Dept. of Zoology. For primary bibliographic entry see Field 5B. W77-03207

BIOLOGICAL AND CHEMICAL EVALUATION OF THE AQUATIC ENVIRONMENT OF SELECTED UNDEVELOPED KENTUCKY LAKE EMBAYMENTS.
Kentucky Water Resources Research Inst., Lexington. M. Gordon, and M. E. Sisk. Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 367. Price codes: A06 in paper copy, A01 in microfiche. Research Report No. 99, December 1976. 117 p, 39 fig, 14 tab, 51 ref. OWRT A-057-KY(1). 14-31-0001-4017. 14-31-0001-5017. 14-31-0001-6018.

Descriptors: Plankton, Benthos, Fish, Pollutants, *Kentucky, Productivity, Limnology, Lakes, Organic wastes, Phosphates, Nitrates, Dissolved oxygen, Hydrogen ion concentration, Phytoplankton, Standing crops.

This report describes research involving biological and chemical analysis of two undeveloped embayments on Kentucky Lake, namely Anderson and Vickers Bays. Field and laboratory studies were made to assess current biotic standing crops, limnological conditions and levels of inorganic and organic pollutants in the embayments. Levels of phosphates, nitrates, and organics are in low to moderate concentrations. The concentration of dissolved oxygen is not a limiting factor, since stress and/or death does not occur in aquatic life

until the dissolved oxygen is below 4 ppm. The hydrogen ion concentration is between 5.0 and 9.0 that has been established as not lethal to most freshwater fishes. Alkalinity is within the normal range for surface waters. Specific conductance is less than 100 micromhos, the maximum value for most waters in Eastern United States. The total dissolved solid concentration derived from specific conductance (100 to 200 ppm) is within the range for most open basin lakes. Average monthly total phytoplankton counts in the embayment indicate low to moderate levels of enrichment. Both embayments are relatively free of gross organic and industrial pollutants. This survey provides established physical, chemical, and biological data which may be useful in detecting future changes in the environment before deleterious effects are produced.
W77-03209

ORGANIC PHOSPHORUS IN LAKES.
Wisconsin Univ., Madison. Water Chemistry Lab. S. J. Eisenreich. Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 452. Price codes: A11 in paper copy, A01 in microfiche. Ph.D. Thesis, 1976. 191 p, 31 fig, 18 tab, 82 ref. OWRT B-088-WIS(1). 14-31-0001-4140.

Descriptors: *Phosphorus, *Lakes, *Eutrophication, *Algae, Chemicals, *Metals, Organic wastes, *Wisconsin, Phosphates, Analytical techniques. Identifiers: *Organic phosphorus, Chemical treatment, Alum, *Aluminum hydroxide, Inorganic phosphorus.

The chemical factors controlling the removal of particulate phosphorus (PP), organic phosphorus (Po) and inorganic phosphorus (Pi) from lake waters by aluminum hydroxide have been investigated. Aluminum hydroxide has large adsorption capacity for Pi in distilled and lake water environments (250-280 micro-g P/mg Al). Optimum P removals occurred at low (<4) and high pH (>9-10), and were minimum in the pH range normally encountered in natural waters. The adsorption of Pi and model Po species by amorphous Al-hydroxide was studied over the equilibrium concentration range of 8 x 10⁻⁷ to 1 x 10⁻⁴ M under normal lake pH conditions using the Langmuir adsorption isotherm. The interactions of natural and model Po compounds with aluminum hydroxide lead to the belief that the fraction of native Po which is not responsive to alum treatment consists of a heterogeneous component formed by the association of biologically-produced Po and native Pi with inorganic and organic matter in the lake water and not identical to Po compounds normally isolated from aquatic organisms. Solution composition cannot alone account for the lack of Po removal with alum. The non-responsive nature of the Po component is most likely a result of steric, structural or localized ionic aberrations. The ultimate success of lake rehabilitation by alum treatment depends primarily on three factors: (1) the effective immobilization of Pi and Po in the water column; (2) the inhibition of P regeneration from the sediments by covering with a layer of Al-gel; and (3) the limitation of P inputs from external sources. The lake should be treated at spring or fall overturn when Pi is the predominant P form to achieve maximum P removals. A simplified method for the analysis of total P (TP), total dissolved P (TDP) and dissolved reactive P (DRP) in multiple water samples has been developed.
W77-03210

ASSESSMENT OF POTENTIAL INTERACTIONS OF MICROORGANISMS AND POLLUTANTS RESULTING FROM PETROLEUM DEVELOPMENT ON THE OUTER CONTINENTAL SHELF IN THE BEAUFORT SEA.
Louisville Univ., Ky. Dept. of Biology. R. M. Atlas.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 9. Chemistry and Microbiology, p 1-286, April 1976. 2 fig, 44 tab, 25 ref.

Descriptors: *Alaska, *Microorganisms, *Pollutants, Ecosystems, *Oil pollution, *Oil spills, *Baseline studies, *Resources development, *Environmental effects, *Water pollution effects, Ecology, Data collections, Bacteria, Fungi, Enteric bacteria.
Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, Oil development, Beaufort Sea, Salmonella-Shigella, Vibrio, Pseudomonas.

The potential interactions of microorganisms and pollutants that may result from development of petroleum resources in the outer continental shelf of the Beaufort Sea were investigated. Studies were begun on establishing a baseline description of microbial communities in the Beaufort Sea. This baseline description includes quantitative information on the occurrence of different physiological groups of microorganisms and on the qualitative taxonomic characteristics of dominant species of microorganisms. It includes information on the ability of the indigenous microorganisms to transform petroleum hydrocarbons that might enter the ecosystem from outer continental shelf petroleum development. A review of existing literature on microorganisms in the Beaufort Sea including microorganisms related to petroleum pollutants was conducted using the computer search facilities OASIS and of the Lockheed data base. (Sinha-OEIS)
W77-03217

ASSESSMENT OF POTENTIAL INTERACTIONS OF MICROORGANISMS AND POLLUTANTS RESULTING FROM PETROLEUM DEVELOPMENT ON THE OUTER CONTINENTAL SHELF IN THE GULF OF ALASKA, Louisville Univ., Ky. Dept. of Biology.
R. M. Atlas.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 9. Chemistry and Microbiology, p 287-345, April 1976. 2 fig, 25 tab, 30 ref.

Descriptors: *Alaska, *Microorganisms, Pollutants, Water pollution effects, *Environmental effects, *Baseline studies, *Oil pollution, *Oil spills, *Resources development, Shellfish, Enteric bacteria, Data collections.
Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, *Oil development, Gulf of Alaska, Human pathogens, Salmonella-Shigella, Vibrio.

The potential interactions of microorganisms and pollutants that may result from development of petroleum resources in the outer continental shelf of the Gulf of Alaska were investigated. Studies were begun on establishing a baseline description of microbial communities in the Gulf of Alaska. This baseline description includes quantitative information on the occurrence of different physiological groups of microorganisms and on the qualitative taxonomic characteristics of dominant species of microorganisms. It includes information on the ability of the indigenous microorganisms to transform petroleum hydrocarbons that might enter the ecosystem from outer continental shelf petroleum development. Also, information is included on the natural incidence of potential human pathogens in shellfish in the Gulf of Alaska. A review of existing literature on microorganisms in the Gulf of Alaska including microorganisms related to petroleum pollutants and pathogenic microorganisms was conducted using the computer search facilities OASIS and of the Lockheed data base. (Sinha-OEIS)
W77-03218

TRACE HYDROCARBON ANALYSIS IN PREVIOUSLY STUDIED MATRICES AND METHODS DEVELOPMENT FOR: (A) TRACE HYDROCARBON ANALYSIS IN SEA ICE AND AT THE SEA ICE-WATER INTERFACE, (B) ANALYSIS OF INDIVIDUAL HIGH MOLECULAR WEIGHT AROMATIC HYDROCARBONS, National Bureau of Standards, Washington, D. C. Trace Organic Analysis Group.
For primary bibliographic entry see Field 5A.
W77-03219

ENVIRONMENTAL ASSESSMENT OF ALASKAN WATERS - TRACE ELEMENT METHODOLOGY - INORGANIC ELEMENTS, National Bureau of Standards, Washington, D. C. For primary bibliographic entry see Field 5A.
W77-03220

DISTRIBUTION OF LIGHT HYDROCARBONS, C1-C14, IN THE NORTHEAST GULF OF ALASKA AND THE SOUTHEASTERN BERING SHELF, National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03221

BASELINE STUDY OF MICROBIAL ACTIVITY IN THE BEAUFORT SEA AND GULF OF ALASKA AND ANALYSIS OF CRUDE OIL DEGRADATION BY PSYCHROPHILIC BACTERIA, Oregon State Univ., Corvallis. Dept. of Microbiology.
R. Y. Morita, and R. P. Griffiths.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Report for the Year Ending March 1976, Vol 10. Chemistry and Microbiology, p 147-191, April 1976. 12 fig, 9 tab, 03-5-022-68.

Descriptors: *Alaska, *Microbial degradation, *Oil spills, *Oil pollution, *Microorganisms, *Resources development, *Water pollution, *Baseline studies, *Environmental effects, Bacteria, Sediments, Biodegradation, Pollutant identification.
Identifiers: *Outer Continental Shelf, *Crude oils, Oil exploration, Oil development, Microbial activity, *Gulf of Alaska, *Beaufort Sea, *Psychrophilic bacteria, Desulfotomaculum.

The levels of potential glutamic acid uptake observed in water samples taken from the Beaufort Sea were as high as those observed in other relatively productive marine waters. In both Barrow and Prudhoe Bay there were locations which consistently showed higher levels of potential microbial activity. When the effects of incubation temperature on the maximum potential velocity of glutamic acid uptake was studied, it was found that there was a marked increase with increasing incubation temperature. Studies on the effects of melted ice water on heterotrophic potential data suggest that when melting ice water is released into the surrounding seawater, there is little effect on the observed microbial activity or the percent respiration. The acute effects of crude oil on the uptake and respiration of glutamic acid was studied by adding an aqueous crude oil extract to the reaction bottles used to determine heterotrophic potential. No consistent alteration in function was observed when the extract was added. Changes in the heterotrophic potential with time were studied in a natural microbial population exposed to crude oil using both labeled glutamic acid and acetate. In the initial stages of incubation, the levels of activity were lower in the crude oil enrichment but as incubation progressed, the levels of activity increased. Sulfate reducing bacteria appear to be very common in the inshore sediments of the Beaufort Sea. Psychrophilic crude oil degrading bacteria are probably quite rare in the waters of

the Beaufort Sea. Of the 150 crude oil degrading bacterial strains isolated from this region, only three strains have a maximum growth temperature below 20C. Hence most of the bacteria degrading crude oil are probably psychrotrophic. (Sinha-OEIS)
W77-03223

HYDROCARBONS: NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF, Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 5B.
W77-03224

MICROBIAL RELEASE OF SOLUBLE TRACE METALS FROM OIL IMPACTED SEDIMENTS, Alaska Univ., College. Inst. of Marine Science. R. Barsdate.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 10. Chemistry and Microbiology, p 367-380, April 1976. 1 tab, 03-5-022-56.

Descriptors: *Alaska, *Oil pollution, *Copper, *Water pollution, *Oil spills, *Baseline studies, *Resources development, *Environmental effects, Sediments, Benthos.
Identifiers: *Outer Continental Shelf, Bering Sea, Trace metals.

This project is an investigation of the possible remobilization of trace metals from crude oil impacted sediments. The initial results of laboratory experiments suggest that the copper concentration of sediment pore water may increase following the addition of oil, and tentatively the effect is ascribed to the occlusion of trace metal binding or exchange sites by components of the oil. The primary activity of the study has been to follow the distribution and/or abundance of metals with time in small experimental containers to which oil has been added. Two principal analytical methodologies have been employed -- a radioisotope tracer technique and anodic stripping voltammetry. The initial results indicate a distinct but small increase in total dissolved copper following the addition of oil to water-sediment systems. Since the increase appears within twenty-four hours, the most likely but highly tentative conclusions is that the oil has occluded trace metal sorption/exchange sites on the sediment particles. (Sinha-OEIS)
W77-03225

INCIDENCE OF PATHOLOGY OF MARINE FISH DISEASES IN THE GULF OF ALASKA, BERING SEA, AND BEAUFORT SEA, California Univ., Davis.
For primary bibliographic entry see Field 5B.
W77-03226

EFFECTS OF SEASONABILITY AND VARIABILITY OF STREAMFLOW ON NEARSHORE COASTAL AREAS, Alaska Univ., College. Inst. of Water Resources. R. F. Carlson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 23-73, April 1976. 10 fig, 4 tab, 15 ref. 03-5-022-56.

Descriptors: *Alaska, *Streamflow, *Oil spills, *Oil pollution, *Water pollution, *Baseline studies, *Resources development, *Environmental effects, Seasonal, Sediments, Leases.
Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, *Petroleum resources, Near-shore processes.

An understanding of the seasonability and variability of streamflow is of considerable engineering importance to the imminent oil and gas develop-

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

ment. Streamflow variability, the effects of seasonal ice, as well as sediment characteristics and ice jam flooding have considerable impact on nearshore and estuarine areas. This is especially so in areas where sea ice remains intact after the initiation of river break-up. This occurs in nearly all rivers and streams in the North Bering, Chukchi, and Beaufort Seas, because the extensive areas of shorefast ice formed annually in these areas. The estuarine and shorefast areas are presently being developed and leased and this development is likely to continue throughout the O.C.S. program. In addition to the statistical characterization using standard hydrological methods, the following parameters are described for the 41 streams which have been gaged for varying periods of time: average period of break-up initiation (10 day period); average period of freeze-up (10 day period); miscellaneous break-up and freeze-up data; relative hypsometric curve for each basin; observations on past ice jam flooding; verbal description of annual flow variation; and use of original indices developed in this study to relate streamflow variability to basin characteristics and regional climate. (Sinha-OEIS)
W77-03229

GULF OF ALASKA STUDY OF MESOSCALE OCEANOGRAPHIC PROCESSES (GAS-MOP), National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-03230

BRISTOL BAY OCEANOGRAPHIC PROCESSES (B-BOP), National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03232

STD MAPPINGS OF THE BEAUFORT SEA SHELF, Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-03233

OUTER CONTINENTAL SHELF ENERGY PROGRAM, National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5B.
W77-03234

MESOSCALE CURRENTS AND WATER MASSES IN THE GULF OF ALASKA, Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W77-03236

HISTORICAL AND STATISTICAL OCEANOGRAPHIC DATA ANALYSIS AND SHIP OF OPPORTUNITY PROGRAM, Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W77-03237

TRANSPORT OF POLLUTANTS IN THE VICINITY OF PRUDHOE BAY, ALASKA, National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 5B.
W77-03238

BENTHOS-SEDIMENTARY SUBSTRATE INTERACTIONS, Alaska Univ., College. Inst. of Marine Science.

C. M. Hoskin.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 25-305, April 1976. 1 fig, 2 tab, 18 ref. 03-5-022-56.

Descriptors: *Alaska, *Benthos, *Oil pollution, *Water pollution effects, *Resources development, *Baseline studies, *Environmental effects, *Bottom sediments, Sediments.
Identifiers: *Outer Continental Shelf, *Petroleum resources, Oil exploration, Oil development, Substrates, *Bering Sea.

The overall goal of the work was to relate grainsize characteristics of bottom sediment to the distribution and abundance of benthos living in and on the sedimentary substrate. Because there are interactions between living benthos and their sedimentary substrate, perturbations in the physical or chemical nature of the substrate may cause perturbation in the distribution, species composition, and/or abundance of the benthos. Because the benthos, and man, are important parts of the food web in the Bering Sea, baseline data are needed to evaluate changes in the sedimentary substrate that could occur through exploitation of oil and gas resources. (Sinha-OEIS)
W77-03263

THE INTERACTION OF OIL WITH SEA ICE IN THE ARCTIC OCEAN, Washington Univ., Seattle. Dept. of Oceanography.
S. Martin.

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 1-7, April 1976. 2 fig. 03-5-022-67.

Descriptors: *Arctic Ocean, *Sea ice, *Oil spills, *Oil pollution, *Water pollution, *Baseline studies, *Resources development, *Environmental effects, Cold regions.
Identifiers: *Outer Continental Shelf, *Oil exploration, *Oil development, *Petroleum resources, Oil-ice interaction, Bering Sea, Beaufort Sea.

The purpose of the present study was to outline the various ways in which the sea ice of the Alaskan coast will entrain and interact with an oil spill or blow-out under the ice. The study concentrates on the small-scale properties of sea ice; namely, its salinity, temperature, and crystal structure, and is only indirectly concerned with the large scale transport and deformation of sea ice. The study divides into two parts: a laboratory experiment on ice growth in a wave field, which stimulates parts of the Bering Sea, and a field survey which consists of taking ice cores from the Beaufort Sea at different times of the year. In the laboratory experiment oil was injected under the growing ice to study the entrainment; in the field survey, cores were analyzed to see how oil might be entrained within them. (Sinha-OEIS)
W77-03267

ENVIRONMENTAL INVENTORY AND ASSESSMENT OF NAVIGATION POOLS 24, 25, AND 26, UPPER MISSISSIPPI AND LOWER ILLINOIS RIVERS; AN ELECTROFISHING SURVEY OF THE ILLINOIS RIVER, Illinois Natural History Survey, Havana. River Research Lab.
For primary bibliographic entry see Field 8L.
W77-03302

HYDROLOGY AND ENVIRONMENTAL ASPECTS OF ERIE CANAL (1817-99), Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 8B.
W77-03334

THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS, Michigan Univ., Ann Arbor.
R. H. Kadlec, C. J. Richardson, and J. A. Kadlec. Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 192. Price codes: A09 in paper copy, A01 in microfiche. Semi-Annual Report No. 4, December, 1975. 203 p, 27 fig, 59 tab, 50 ref.

Descriptors: *Wetlands, *Sewage disposal, *Irrigation, *Nutrients, *Ecosystems, Biomass, Simulation analysis, Plant growth, Sewage effluents, Statistical methods, *Michigan, Water pollution effects, Path of pollutants.

Ongoing studies of the effects of sewage effluents in wetland ecosystems are reported, with particular emphasis on the nutrient status of the surface and interstitial waters of peatlands in Michigan. Specific topics covered include: the effects of simulated sewage effluent on the decomposition, nutrient status, and litterfall in a central Michigan peatland, the effects of simulated sewage effluents on the growth and productivity of peatland plants, pilot scale irrigation experiments, a statistical analysis of seasonal changes in biomass (standing crop new growth) of selected wetland species as influenced by nutrient additions, and studies of dissolved nutrients in Michigan peatland. (Kreager-FIRL)
W77-03354

RESIDUAL WASTE MANAGEMENT RESEARCH AND PLANNING PROJECTS, SEPTEMBER 1975, Environmental Protection Agency, Washington, D. C. Water Planning Div.
For primary bibliographic entry see Field 5B.
W77-03355

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, AND CHEMICAL OCEANOGRAPHY, National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5B.
W77-03358

PRELIMINARY ASSESSMENT OF SUSPECTED CARCINOGENS IN DRINKING WATER: REPORT TO CONGRESS, Environmental Protection Agency, Washington, D. C. Office of Toxic Substances.
For primary bibliographic entry see Field 5A.
W77-03360

THE IMPACT OF FARGO, NORTH DAKOTA'S WASTE DISCHARGES ON THE INTERSTATE WATERS OF THE RED RIVER OF THE NORTH, SEPTEMBER 1969-APRIL 1970, Federal Water Quality Administration, Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W77-03361

EFFECT OF CALCIUM FROM THE WATER ENVIRONMENT ON TISSUE METABOLISM OF PHOSPHATES IN ANODONTA CYGNEAL (IN RUSSIAN), Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
V. D. Romanenko, N. P. Galagan, and V. D. Solomatina.
Gidrobiol Zh 11(3), p 32-37, 1975.

Descriptors: *Calcium, *Ions, *Metabolism, *Mollusks, *Salt Tolerance, Dissolved solids, Phosphorus, *Phosphates, Water pollution effects.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

Identifiers: *Anodonta cygnea*, ATPase, Gills, Hepatopancreas, Mantle, Muscles, Phosphatase, Osmoregulation, U.S.S.R.

Tissue metabolism of *A. cygnea* is considered as influenced by an increased content of Ca in the water. Under experimental conditions considerable changes were observed in the content of general and inorganic P, ATPase and alkaline phosphatase activity of hepatopancreas, muscles and especially mantle and gills. The data testify to an essential effect of Ca+2 from the water on bioenergetic reactions responsible for osmoregulation and other processes connected with salt adaptation of the mollusks.
W77-03366

EXPERIMENTAL STUDIES ON MATERIAL TRANSACTIONS BETWEEN MUD AND WATER OF THE GNADENSEE, M. W. Banoub.

In: *Verhandlungen Internationale Vereinigung Limnologie*, Vol. 19, Part II, p. 1263-1271, 1975. 7 fig., 1 tab., 28 ref.

Descriptors: *Mud-water interfaces, *Phosphorus, Lakes, Laboratory tests, Cycling nutrients, Sampling, Phosphates, Water pollution effects.
Identifiers: *Gnadensee, Reeds.

The release rates of phosphorus from muds of the reed-dominated banks of the Gnadensee (Bodensee) are estimated. Results revealed that the release of phosphorus from both aerobic and anaerobic conditions followed a sigmoid trend due primarily to reactive phosphorus. Organic phosphorus showed an irregular release which did not exceed a value of 300 µg P/l and its variations could not be correlated with the experimental conditions. Reactive phosphorus increased steadily reaching equilibrium levels depending on the rate of sampling, temperature, and the experimental conditions. The highest concentration reached was 13.0 mg P/l under combined anaerobic condition and 25 °C. At high concentrations of phosphorus there was an apparent increase of organic phosphorus due to the method of calculation. The range and average PO4-P release at the four temperatures used to incubate the mud showed an almost linear relation with temperature up to 15 °C. Upon aeration, PO4-P decreased to a minimum, then increased steadily again in the presence of oxygen. Anaerobic conditions also caused a decrease in PO4-P in water above the mud. Leachates from decomposing reed stems caused an increase in PO4-P and reactive iron in the water phase. Iron added to mud cylinders under anaerobic conditions showed no appreciable effects on phosphate until a dose of 10 mg Fe/l was reached. Doses of up to 50 mg Ca/l had a slight effect on phosphate, while 500 mg Ca/l caused apparent loss to the mud. (Luedtke-Wisconsin)
W77-03370

REPORT ON POLLUTION IN LAS VEGAS WASH AND LAS VEGAS BAY.

Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Technical Services. Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 653. Price codes: A03 in paper copy, A01 in microfiche. January 1967. 24 p., 10 tab., 2 fig., append.

Descriptors: *Water pollution sources, *Waste water (Pollution), *Public health, Waste water treatment, Effluents, Recreation, Coliforms, Salmonella, Aquatic bacteria, Sewage bacteria, Algae, Productivity, Phosphorus, Nitrogen, Colorado River basin, Hoover Dam, Impoundments, Nevada.
Identifiers: *Lake Mead (Nev.), Las Vegas (Nev.), Clark County (Nev.), Las Vegas Bay (Nev.), Boulder Beach (Nev.), Las Vegas Wash (Nev.).

Algae growths resulting from phosphorus and other nutrient discharges from the city and county sewage treatment plants at Las Vegas, Nevada is producing an objectionable aesthetic condition which, if allowed to continue unabated, will destroy the recreational value of the Las Vegas Bay area of Lake Mead in the Colorado River basin. To maintain algae counts of less than 2,000/ml throughout the area, sewage treatment plants should not discharge a concentration of more than 1.2 mg/l in their effluents. This standard would require 90-92% reductions in effluent phosphorus concentrations for the two sewage treatment plants. Excessive densities of coliform were discovered in the effluents of both sewage plants and salmonella in the Las Vegas city effluent and in the Las Vegas Wash region of the lake, indicating a need to improve chlorination facilities. However, coliform levels throughout Las Vegas Bay and in the Boulder Beach area are well below the levels of concern for direct contact water activities. At Boulder Beach, increased counts are the result of augmented bathing activity rather than pollution discharges from outside the area. Concentrations of metals and organic pesticides in the Las Vegas Bay area are both below levels of concern. (Harris-Wisconsin)
W77-03371

A REVIEW OF CLUSTERING TECHNIQUES WITH EMPHASIS ON BENTHIC ECOLOGY, Portland State Univ., Oregon Urban Studies Center. For primary bibliographic entry see Field 5A. W77-03372

EVALUATION OF LAKE MILNER WATER QUALITY MODEL, Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 5B. W77-03373

THE PRIMARY PRODUCTION OF THE PERIPHYTON ASSOCIATION OEDOGONIO-EPITHEMIETUM LITORALAE, R. Bohr, and M. Luscinska. In: *Verhandlungen Internationale Vereinigung Limnologie*, Vol. 19, Part II, p. 1309-1312, 1972. 1 fig., 5 ref.

Descriptors: *Primary productivity, *Periphyton, Lakes, Biomass, Photosynthesis, Chlorophyta, Cladophora, *Eutrophication, Water pollution effects.
Identifiers: *Lake Jeziorak (Poland), *Lake Tynwald (Poland), *Oedogonio-Epithemietum littoralae, *Poland.

The association Oedogonio-Epithemietum littoralae, often found in eutrophic lakes in Northern Poland, was studied in Lake Jeziorak and Lake Tynwald. The association developed poorly in Lake Jeziorak, with a low percentage of green algae, a dominance of diatoms, and a regular expansion of periphyton communities was estimated at an average of 0.88 kcal/sq m/day. A more detailed examination of periphyton primary productivity in Lake Tynwald resulted in the following conclusions: (1) Cladophora is a biennial component able to survive the winter and yield considerable amounts of biomass on last years reed stem in the spring, though a rather small production, (2) at the same time, populations of filamentous green algae appear on the new substrate supplied by the growing young reed blades, yielding a biomass of 10.9 kcal/sqm with a high production intensity, (3) the dominance of the filamentous green algae persists throughout the summer, constituting 92% of the total biomass, (4) in autumn, the external climatic conditions have a reducing effect on the production, and (5) the total increment or net production of organic substance produced by photosynthesis during the vegetative season was estimated to be 857 kcal/sqm, the coefficient P/B was 15, and the turnover was 16 days. (Luedtke-Wisconsin)
W77-03374

THE IMPACT OF A FOREST FIRE ON A WILDERNESS LAKE IN NORTHEASTERN MINNESOTA, Minnesota Univ., Minneapolis. Limnological Research Center. For primary bibliographic entry see Field 5B. W77-03375

THE PRIMARY PRODUCTION OF LAKE SIBAYA, KWAZULU, SOUTH AFRICA, B. R. Allanson, and R. C. Hart. In: *Verhandlungen Internationale Vereinigung Limnologie*, Vol. 19, Part II, p. 1426-1433, 1975. 6 fig., 1 tab., 6 ref.

Descriptors: *Photosynthesis, Aquatic algae, Productivity, Lakes, Africa, Tropical regions, *Primary productivity, Cycling nutrients, Eutrophication, Carbon, Waste assimilative capacity.
Identifiers: *Lake Sibaya (South Africa), Warm water lakes, Talling-Rodhe-Vollenweider model, *Carbon 14.

Carbon 14 uptake by the algal community of Lake Sibaya, South Africa was studied during 1973-1974, and the results were compared with studies of other warm water lakes. Carbon assimilation in Lake Sibaya, though showing a cool season depression, is largely light limited. The appearance of the photosynthetic rate curves with depth and season led to an attempt to use the Talling-Rodhe-Vollenweider model to fit the pelagic photosynthesis in response to light attenuation. A graphical solution, using Rodhe's methods is given, and confirms the adequacy of the model in determining the photosynthetic integral. The extinction of white light gave a closer fit to the observed value than the extinction of the most penetrating component in the lake, green light. It is concluded on the basis of these results, together with those of prior work, that Lake Sibaya behaves photosynthetically in a similar way to many other lakes. Comparison with other lakes show that Lake Sibaya has the lowest maximal productivity of tropical lakes so far studied. Results of the study are also considered with respect to Brylinsky and Mann's analysis of factors governing productivity in lakes and reservoirs. (Luedtke-Wisconsin)
W77-03376

LAKE PHOSPHORUS LOADING GRAPHS: AN ALTERNATIVE, Environmental Protection Agency, Corvallis, Oregon. Eutrophication and Lake Restoration Branch. D. P. Larsen, and H. T. Mercier. Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 869. Price codes: A03 in paper copy, A01 in microfiche. Working Paper No. 174, July 1975. 30 p., 4 tab., 5 fig., 22 ref.

Descriptors: *Analytical techniques, *Trophic level, *Phosphorus, *Eutrophication, Oligotrophy, Lakes, Lake stages, Graphical analysis, Flow characteristics, Hydraulics, Model studies, Waste assimilative capacity.
Identifiers: *Phosphorus loading graphs, Phosphorus retention capacity, Phosphorus mass balance models, Hydraulic washout coefficient, Areal hydraulic load.

An improved analytical technique is described by which predictions can be made as to a lake's trophic state and changes in the trophic state caused by variations in the phosphorus level. The new technique is a graph of mean influent phosphorus concentration compared with phosphorus retention capacity, in which a relationship is expressed between phosphorus supply and hydraulic flow, on one hand, and the resultant trophic state of lakes. The graph takes into account a relationship derived directly from the steady state solution of a simple phosphorus mass balance model, and predicts trophic state and

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

changes in trophic state caused by manipulating in-fluent phosphorus concentrations and/or manipulating the assimilative capacity of a lake for phosphorus. The technique is intended as an alternative to phosphorus loading graphs, some of which have been developed from mass balance models that describe the relationship between lake phosphorus concentrations and the amount of phosphorus entering the lake. Empirical expressions are provided for use in studies of oligotrophic lakes, where predictions are to be made relating phosphorus retention capacity to areal hydraulic load or hydraulic washout coefficient. (Harris-Wisconsin)
W77-03377

DELAWARE 1975 STATE WATER QUALITY INVENTORY.
Department of Natural Resources and Environmental Control, Dover, Dela. Div. of Environmental Control.
For primary bibliographic entry see Field 5G.
W77-03378

WINTER CONDITIONS IN THE NEW YORK BIGHT, 1973-1974.
Grumman Ecosystems Corp., Bethpage, N. Y.; and Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 191. Price codes: A10 in paper copy, A01 in microfiche. Report No. NYSERDA-7507, September 1974. 223 p. 42 fig., 69 tab., 8 append., 81 ref.

Descriptors: *Oceanography, *Marine biology, *Nuclear powerplants, *Offshore platforms, Atlantic Ocean, Northeast U.S., Hydrography, Hydrologic aspects, Nannoplankton, Seasonal, Temperature, Isotherms, Thermal pollution, Water pollution sources, Shores, Sea water, Physical properties, Environmental effects, Chemical analysis, Chemical properties, Sediments, Benthos, Winter, Primary productivity, Fish eggs, Phytoplankton, Chlorophyll, Zooplankton.
Identifiers: *New York Bight, Halocline, Pycnocline.

Initial results and analysis of an oceanographic and marine biological study of an 800 sq. mile area extending 15 miles offshore south of Long Island, New York—related to the proposed offshore siting of nuclear power plants—indicate: (1) the waters are generally well-mixed, isothermal, strongly driven by winds as well as tides, with typically highly-productive inshore marine biological communities; (2) despite extreme hydrological variability related to significant geographic differences in the study area, and taking into account anomalies in the vicinity of offshore dump sites, all biological communities follow a well-defined seasonal succession; (3) most of the chemical constituents show geographical as well as temporal variation, but ammonia was generally concentrated near the bottom; (4) Hudson River waters probably cause a pronounced halocline and pycnocline developed by late January in the northwest quadrant, and vertical gradients of salinity and density are apparent on all edges of the area by March; (5) nannoplankton predominates among the algal standing crop and primary productivity in November-December but is equally divided between net and nannoplankton by March, with larger diatoms assuming dominance; (6) zooplankton and fish eggs are minimal in January-February and most abundant in March. (Harris-Wisconsin)
W77-03380

ASSATEAGUE ECOLOGICAL STUDIES.
Maryland Univ., Solomons. Natural Resources Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 131. Price codes: A19 in paper copy, A01 in microfiche.

Report No. ASIS-01-75, Part I, October, 1970. 428 p. 106 fig., 44 tab., 710 ref., 1 append. 14-10-5-950-36.

Descriptors: *Barrier islands, *Census, *Maryland, *Virginia, Atlantic Ocean, Environmental effects, Sediment distribution, Currents(Water), Geology, National seashores, Coasts, Data collections, Dredging, Climatology, Primary productivity, Salt marshes, Tidal effects, Benthos, Fish populations, Crustaceans, Commercial fishing, Groundwater resources, Bibliographies, Ecology.
Identifiers: *Assateague Island, *Chincoteague Bay.

This report is a compilation of basic biological, geological, and ecological information for the area surrounding Assateague Island, and is intended along with Parts II and III to facilitate management of this barrier island seashore with particular reference to proposed dredging. The geological history, climatology, sea dynamics, and freshwater sources of the Island are described. Sedimentation distribution and yearly production rates of three major primary productivity sources in Chincoteague Bay, planktonic algae, underwater rooted aquatic plants, and spartina marshes were determined. Groups or communities of benthos in the Bay were identified and related to environmental parameters such as depth and sediment characteristics with particular attention given to the commercially important hardshelled clam. Chincoteague crustacea and fish populations were also surveyed. The development of the Chincoteague Bay commercial fishery in terms of catch records, fishing methods, laws, and research efforts are reviewed, and an extensive bibliography of natural, political, and historical aspects of Assateague Island and vicinity is included. Part II deals with the environment threats due to dredging, insect control and land disturbance, and Part III provides a suggested land use plan. (Luedtke-Wisconsin)
W77-03381

WATER QUALITY IN THE CALUMET AREA. CONFERENCE ON POLLUTION OF LOWER LAKE MICHIGAN, CALUMET RIVER, GRAND CALUMET RIVER, LITTLE CALUMET RIVER, AND WOLF LAKE, ILLINOIS AND INDIANA.
Department of Health, Education, and Welfare, Washington, D.C. Technical Committee on Water Quality.
For primary bibliographic entry see Field 5B.
W77-03382

A PRELIMINARY STUDY OF THE TASTE AND ODOR PROBLEMS IN GRAND LAKE, OHIO AND THE WABASH RIVERS, INDIANA.
Federal Water Pollution Control Administration, Evansville, Ind. Ohio River Basin Project.
M. A. Anderson, and J. H. Adams, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 745. Price codes: A05 in paper copy, A01 in microfiche. October 1969. 80 p. 26 tab., 10 fig., 16 ref., 1 append.

Descriptors: *Taste, *Odor, *Potable water, Water pollution effects, Organoleptic properties, Taste-producing algae, Odor-producing algae, Water properties, Cyanophyta, Actinomycetes, Indiana, Illinois, Ohio.
Identifiers: *Grand Lake(Ohio), *Wabash River basin, Celina(Ohio), Terre Haute(Ind), Huntington(Ind), Mt. Carmel(Ind), Aphaniizomenon, Anacystis, Synedra, Scenedesmus, Cyclotella.

Deleterious olfactory and gustatory effects to the drinking water supply were caused largely by certain blue-green algae and by actinomycetes at Grand Lake near Celina, Ohio, at Huntington and Terre Haute, Indiana and at Mt. Carmel, Illinois, according to results of a 1967-68 study to determine the extent to which these organisms might be responsible for producing noxious tastes and

odors in the lake and along the Wabash River. Among the algae most responsible for the problems at Grand Lake are Aphaniizomenon, Anacystis, Synedra and Scenedesmus. Tastes and odors at Huntington and Terre Haute Indiana are apparently related to the diatom Cyclotella. Actinomycetes contributed only a minor share to the taste and odor problem of water in Huntington, but the organism was especially significant at Grand Lake during a period of high lake levels in February and March and throughout the spring at Terre Haute. High actinomycete counts are largely responsible for springtime taste and odor problems at Mt. Carmel, especially during peak periods of February and May. Most of the actinomycetes in the river are flushed from pools and soils on the floodplain, and their number in the river depends mostly on the amount of flooding that occurs. (Harris-Wisconsin)
W77-03384

POLLUTION OF INTERSTATE WATERS OF THE LOWER COLUMBIA RIVER BETWEEN NEVILLE DAM TO CATHLAMET, WASHINGTON.
Public Health Service, Portland, Oreg. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 5B.
W77-03385

AQUATIC FIELD SURVEY AT IOWA ARMY AMMUNITION PLANT.
Environmental Control Technology Corp., Ann Arbor, Mich.
R. L. Weitzel, P. B. Simon, D. E. Jerger, and J. E. Schenk.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A014 300. Price codes: A08 in paper copy, A01 in microfiche. August 1975. 145 p. 25 tab, 23 fig, 67 ref, 4 append. DAMD 17-74-C-4124.

Descriptors: *Chemical wastes, *Industrial wastes, *Streams, Military reservations, Water pollution sources, Water pollution effects, Aerobic conditions, Aerobic bacteria, Sediments, Industrial plants, Factories, Periphyton, *Iowa.
Identifiers: *Trinitrotoluene(TNT), *Army Ammunition Plant(Iowa), Long Creek(Iowa), Brush Creek(Iowa), Spring Creek(Iowa).

An investigation of aerobic transformation products of trinitrotoluene (TNT) and their fate in aquatic and sedimentary systems in three receiving streams at a government-owned high explosive munitions plant near Burlington, Iowa shows various periphyton-related changes. Minor shifts in periphyton diatom species were found in all three stream systems, corresponding to simultaneous variations in nutrient levels and TNT concentrations in the aqueous environment. Periphyton biomass, organic production, periphyton chlorophyll-A and chlorophyll-A production all generally increase downstream from the plant. The autotrophic index of the periphyton community shows a shift to autotrophic communities downstream in two of the creeks. Certain military munitions-related trace pollutants are present in low but measurable levels in all three streams. Recommendations include requests for surveying of anaerobic transformation of TNT, for sampling of TNT processing line effluent, to evaluate concentration characteristics of TNT on natural versus artificial substrates, and for expanded benthic macroinvertebrate studies to be performed in the vicinity of maximum TNT laden sediments. (Harris-Wisconsin)
W77-03386

SEASONAL INTERACTIONS AMONG ESTUARINE PRIMARY PRODUCERS AND HERBIVORES.
Maryland Univ., Solomons, Md. Chesapeake Biological Lab.
For primary bibliographic entry see Field 2L.
W77-03387

INVESTIGATIONS ON THE ROLE OF DISSOLVED ORGANIC MATTER IN DETERMINING ECOSYSTEM STRUCTURE AND FUNCTION: THE PLANKTON AND PHOTOHETEROTROPHY.

Michigan State Univ., East Lansing. Dept. of Botany.
K. R. McKinley.

Available from the National Technical Information Service, Springfield, VA 22161 as COO-159 995. Price codes: A07 in paper copy, A01 in microfiche. Ph.D. Thesis, 1975, 129 p., 12 fig., 2 tab., 2 append., 137 ref. GB-40172;E(11-1)-1599, COO-1599-95; GB-15665; GB31018X.

Descriptors: *Phytoplankton, *Organic matter, *Ecosystems, Absorption, Succession, Dominant organisms, Trophic level, Plankton, Absorption, *Michigan.
Identifiers: *Photoheterotrophy, Chemoheterotrophy, Heterotrophy, Heterotrophic uptake, Dissolved organic matter, Lawrence Lake(Mich).

Results of a study in which photoheterotrophic uptake in a southwestern Michigan hard-water lake was equal to 67.6% of the chemoheterotrophic activity on a comparative annual basis for the daylight period imply that research of heterotrophic uptake utilizing dark techniques may seriously underestimate total activity. The pelagic zone of Lawrence Lake underwent simultaneous monitoring for uptake of glucose and for photolithotrophic carbon fixation. Light and dark bottle uptake of organic and inorganic carbon was measured, revealing that light bottle uptake of organic material was significantly greater than dark bottle uptake on the average. The patterns of the two heterotrophic activities demonstrate that the processes are separated in space and time on a daily as well as a seasonal basis. Photoheterotrophic activity generally was skewed toward the morning and mid-day, with predominating activity shifting to increasing depths in the water column as the day progressed. Chemoheterotrophic activity generally increased throughout the daylight period and with depth. Heterotrophic fixation as compared with photolithotrophic carbon fixation indicates that photoheterotrophy may contribute significant amounts of carbon to photosynthetic organisms under conditions unfavorable to inorganic carbon fixation, such as low irradiance at depth and under ice cover. (Harris-Wisconsin)
W77-03389

RESPONSE OF DAPHNIA POPULATION SIZE AND AGE STRUCTURE TO PREDATION,
Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W77-03390

SILT REMOVAL FROM A LAKE BOTTOM,
Lake Herman Development Association, Inc., Madison, S. Dak.
C. L. Churchill, C. K. Brashier, and C. S. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 250. Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA 660/3-74-017, February 1975. Ecological Research Series. 37 p., 6 fig., 2 tab., 4 ref., 3 append. 1BA031. 16010 ELF.

Descriptors: *Dredging, *Eutrophication, Nutrients, Phosphorus, Sediment control, Nutrient removal, *South Dakota, Sediments, Lakes, *Silt, Lake beds, *Lake sediments.
Identifiers: *Lake restoration, Lake Herman(SD), *Silt removal.

In a lake restoration program, dredging was used to remove 62,000 cubic yards of silt from a 4.2 hectare area of Lake Herman, South Dakota during the summers of 1970, 1971 and 1972. The silt was transported as slurry via pipeline to a deposit area adjacent to the lake. Water removed by the

process drained by gravity along a gradual slope, where it dropped its silt, lost its nutrients, then returned by pipe to the lake. Slurry water was rich in nutrients, particularly total phosphates. Orthophosphates, however, were uniformly lower in the slurry, in the deposit area, and in the return pipe than they were in the lake water at the point of dredging. Water from the deposit area was less basic and contained less nutrients than lake water, while an increase in vegetation occurred in the deposit site after deposition began. There was no significant change in organism or nutrient levels, except for phosphorus which increased shortly after dredging began. Hardness, silica and turbidity also increased. Core sampling revealed that recently deposited silt was much more fertile than earlier deposits. Greenhouse chrysanthemums grown in silt from the disposal site exhibited larger stems, leaves and flowers, but poorer root systems than those grown in commercial preparations. (Luedtke-Wisconsin)
W77-03392

METHODS OF DISSOLVED OXYGEN BUDGET ANALYSIS FOR ASSESSING EFFECTS OF DREDGED MATERIAL DISPOSAL ON BIOLOGICAL COMMUNITY METABOLISM,
Virginia Univ., Charlottesville, Va.
G. M. Hornberger, and M. G. Kelly.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-018 340. Price codes: A05 in paper copy, A01 in microfiche. Report No. D-75-3, U.S. Army Engineer Waterways Experiment Station, November 1975. 98p., 3 fig., 6 tab., 19 ref., 4 append. DACW-39-74-C-0030.

Descriptors: *Methodology, *Aquatic productivity, *Dissolved oxygen, *Monitoring, Environmental effects, Computer programs, Mathematical studies, Fourier analysis, Data processing, Dredging.
Identifiers: Oxygen mass balance equation, Dredge disposal.

A method for automatically monitoring biological productivity and the dissolved oxygen budget of aquatic systems with the intent of detecting the biological effects of dredging and dredge disposal is described. Three computer programs for calculating a continuous function (a Fourier series) describing net community productivity using measurements of dissolved oxygen concentration, temperature, and salinity with a solution to the oxygen mass balance equation, were developed. These programs pertain to calculation of (1) temporal variation of net productivity in flowing water (rivers), (2) depth-averaged net productivity for a standing water body, and (3) the depth distribution of net productivity in standing waters. These methods are particularly suited for use with continuous automatic data recording systems, and can be used for assessing environmental effects of many engineering activities. Major assumptions in the development of the dissolved oxygen budget include a constant diffusion rate for the 24-hour period, night-time respiration similar to daytime respiration, one gram of biomass produced for each gram of oxygen released, no turbulent circulation patterns, and similar metabolic history of water entering and leaving an area. The required computer programs are presented and their use discussed. (Luedtke-Wisconsin)
W77-03393

TOXICITY OF AMMONIA TO ALGAE IN SEWAGE OXIDATION PONDS,
Hebrew Univ., Jerusalem (Israel). Human Environmental Sciences Lab.
For primary bibliographic entry see Field 5D.
W77-03413

HEAT INACTIVATION OF POLIOVIRUS IN WASTE WATER SLUDGE,
Sandia Labs., Albuquerque, N. Mex.
R. L. Ward, C. S. Ashley, and R. H. Moseley.

Applied and Environmental Microbiology, Vol 32, No 3, p 339-346, September, 1976. 3 fig., 5 tab., 20 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Heat, *Viruses, *Sludge, Anaerobic digestion, Waste dilution, Temperature.
Identifiers: *Poliovirus(Inactivation).

The study was designed to determine the effects of raw and anaerobically digested sludge on the rate of heat inactivation of poliovirus. Three types of poliovirus were grown and plaqueed on a line of HeLa cells. A 10-fold dilution of virus was placed in the sludge samples at room temperature and then flamed to eliminate infectious virus that may have remained above the water line in the incubation bath. Then they were incubated at specified times and temperatures, placed in an ice bath and analyzed by the SDS-sonication procedure. Results showed that viruses are readily inactivated by heat, though the inactivation rate is most dependent on environment. Raw sludge proved consistently protective of poliovirus during heat treatment and digested sludge had erratic effects. The latter, when dilute and at low temperatures, protects the virus but, at high temperatures and concentrations, loss of viral plaque-forming units is more rapid. The difference between the two sludge types is attributed to the acquisition of virucidal activity during digestion. It seemed that a virucidal agent associated with the liquid component of sludge is produced during digestion. Solids of raw sludge are protective during heat inactivation, and this can be reversed by the addition of the liquid fraction of digested sludge. (Collins-FIRL)
W77-03448

MUSSEL TEST FOR BIOLOGICAL CONTROL OF WATER POLLUTION (KAGYLO-TESTZ VIZSENNYEZESEK BIOLOGIAI HATASANAK VIZSGALATARA),
For primary bibliographic entry see Field 5A.
W77-03454

THE AERIAL PHOTO-WATER QUALITY LINK.
For primary bibliographic entry see Field 5A.
W77-03471

PHOTOLYSIS OF 5-CHLOROURACIL IN NATURAL WATERS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W77-03477

RISK OF COMMUNICABLE DISEASE INFECTION ASSOCIATED WITH WASTE WATER IRRIGATION IN AGRICULTURAL SETTLEMENTS,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
E. Katzenelson, I. Buim, and H. I. Shuval.
Science, Vol. 194, No. 4268, p 944-946, November, 1976. 1 fig., 1 tab., 7 ref.

Descriptors: *Waste water treatment, *Sewerage, *Pollutant identification, *Infection, *Human diseases, Waste water(Pollution), Irrigation practices, Irrigation water.

Statistics from 207 kibbutzim (population 82,825) were used to compare morbidity rates between users and nonusers of waste water for irrigation. Data was collected primarily for waterborne diseases such as shigellosis, salmonellosis (not including typhoid fever which was considered separately), infectious hepatitis, and influenza. Streptococcal infections (including scarlet fever) and tuberculosis were chosen as controls. Disease incidence was two to four times higher in settlements using sewage effluent as irrigation water. Though the incidence of clinical influenza was

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

twice as high in sewage-irrigated settlements, there was no difference in the incidence of laboratory diagnosed influenza cases. There was no significant difference in the incidence of the diseases not associated with sewage. Since sewage irrigation is not used during the winter, the similarity of mortality rates supports the hypothesis that there is a link between sewage irrigation and enteric disease incidence. Geographical differences and pathogen transmission by sewage-irrigated crops have been discounted. It was suggested that pathogens from waste water irrigation areas could reach kibbutz populations through alternate pathways, on bodies and clothes of irrigation workers returning to the community. The precaution of waste water treatment, including bacterial and viral disinfection of all waste water used in the vicinity of settlements or residential areas, is urged. (Collins-FIRL)

W77-03485

EUTROPHICATION AND RESTORATION OF LAKES RECEIVING NUTRIENTS FROM DIFFUSE SOURCES ONLY, R. Pechlaner.

Verhandlungen Internationale Vereinigung Limnologie, Vol 19, Part II, p 1272-1278, 1975. 3 fig, 1 tab, 13 ref.

Descriptors: *Nutrient removal, *Water management(Applied), *Eutrophication, Water quality control, Artificial recharge, Foreign countries, Limnology, Recreation wastes, Water pollution sources, Europe, Oxygenation, Phosphorus, Lakes.

Identifiers: *Olszewski tubes, *Lake restoration, *Artificial aeration, Water restoration, Nonpoint-source pollution, Piburger See(Austria), Reither See(Austria), Hechtsee(Austria), Water renewal.

Whereas sewage diversion and other forms of lake sanitation are useful in efforts to reduce, stop or even reverse eutrophication, such prophylactic measures have little effect on nutrients that originate from nonpoint sources; in the latter case, priority must be given to lake restoration methods such as the artificial aeration by means of hypolimnetic outlets (Olszewski tubes). Lake restoration activities are described for three stratified recreational lakes in Tyrol, Austria which are characterized by some agricultural land use, sparse populations and intensive tourism. Olszewski tubes were installed at Piburger See, Reither See and Hechtsee. Secchi disc transparency, oxygen stratification, phosphate concentrations, phytoplankton measurements, algae productivity and other eutrophication indices have been made before and after mounting of the Olszewski tubes. The tubes remove anaerobic water and with up to 300 micrograms per liter total phosphorus from the deepest part out of the lake. Efforts have been markedly successful in Piburger See and Reither See, but effects on lake stratification have not yet been observed in Hechtsee. (Harris-Wisconsin)

W77-03536

PHYTOPLANKTON RESPONSE TO PHOSPHORUS AND SILICA ENRICHMENTS IN LAKE MICHIGAN, Michigan Univ., Ann Arbor. Great Lakes Research Div.

C. L. Schelske, M. S. Simmons, and L. E. Feldt. Verhandlungen Internationale Vereinigung Limnologie, Vol 19, Part II, p 911-921, 1975. 3 fig, 7 tab, 13 ref. AEC C00-2003-24, NSF GA-4507.

Descriptors: *Lake Michigan, *Phytoplankton, *Nutrients, *Primary productivity, Phosphorus, Silica, Photosynthesis, Chlorophyll, Diatoms, Dominant organisms, Rivers, Eutrophication.

Identifiers: Muskegon River(Mich), Grand River(Mich), Kalamazoo River(Mich), St Joseph River(Mich).

Results of experiments made to study effects of small additions of phosphorus on natural Lake Michigan phytoplankton assemblages and the effects of silica and river water when combined with additions of phosphorus are described. Four locations were used along the southeastern shore of the lake, offshore near the Muskegon, Grand, Kalamazoo and St. Joseph rivers. Water pumped from the lake was treated with different combinations and levels of phosphorus, silica, and river water. The added phosphorus increased rates of carbon fixation and chlorophyll production, and in some experiments the same effect was achieved through addition of the silica and river water dilutions. In the Muskegon River experiment, phosphorus additions more than doubled the rate of carbon fixation and production of chlorophyll. Without added phosphorus there was no silica-induced effect, but river water increased the rate of carbon fixation more than two-fold. Somewhat similar results were obtained for phosphorus additions on carbon fixation and chlorophyll production in the other three stations, but greater variations were shown for the other experiments. The results confirm the conclusion that the sensitivity of Lake Michigan phytoplankton to small increases in nutrient loading is great. (Harris-Wisconsin)

W77-03537

LIMNOLOGICAL CHARACTERISTICS OF STRIP MINE PONDS IN NORTHWESTERN COLORADO, U.S.A., E. B. Reed.

Verhandlungen Internationale Vereinigung Limnologie, Vol 19, Part II, p 856-865, 1975. 10 fig, 6 ref.

Descriptors: *Strip mine lakes, *Food chains, *Fisheries, Strip mines, Rainbow trout, Ecosystems, Productivity, Fish establishment, Fish stocking, Fish management, Sport fishing, *Colorado.

Identifiers: Lake restoration, Water restoration.

Two Routt County, Colorado high-altitude strip mine ponds resulting from accumulation of water in surface excavation sites, were studied for two years to acquire water quality information anticipatory to establishing recreational fisheries. At Camilletti and Salamander Ponds, studies were made of physical, chemical and hydrobiological characteristics, including food web components. Salamander Pond's food web includes primary production of benthic algae and pondweed, detritus, insects and zooplankton, salamander and frogs, and water snake. The Camilletti food web is based on primary production of Chara, detritus, zooplankton, insects, snails, amphipods, and rainbow trout. In the Camilletti food web—unlike Salamander's—there was a distinct important link in the food chain that joins zooplankton production to higher-level production. Productivity in Salamander Pond could be improved by introducing a small number of catchable-size trout each spring. These would replace salamanders and water snakes at the apex of the food web in the pond. Temperature and oxygen conditions apparently permit rainbow trout survival in Camilletti Pond during the winter, but in Salamander Pond almost certain winter-kill means that a fishery could be maintained only on a put-and-take basis. (Harris-Wisconsin)

W77-03538

SIMULATION OF PESTICIDE MOVEMENT ON SMALL AGRICULTURAL WATERSHEDS, ESL, Inc., Sunnyvale, Calif.

For primary bibliographic entry see Field 5B. W77-03540

IDAHO ENVIRONMENTAL OVERVIEW, Consulting Engineers, Inc., Boise, Idaho.

For primary bibliographic entry see Field 6G. W77-03557

DETERMINATION OF MAXIMUM PERMISSIBLE LEVELS OF SELECTED CHEMICALS THAT EXERT TOXIC EFFECTS ON PLANTS OF ECONOMIC IMPORTANCE IN ILLINOIS, Southern Illinois Univ., Carbondale.

For primary bibliographic entry see Field 5A. W77-03565

THE IMPACT OF INTENSIVE APPLICATION OF PESTICIDES AND FERTILIZERS ON UNDERGROUND WATER RECHARGE AREAS WHICH MAY CONTRIBUTE TO DRINKING WATER PROBLEMS.

Environmental Protection Agency, Washington, D.C. Office of Toxic Substances. For primary bibliographic entry see Field 5B. W77-03567

EXPERIMENTAL SUBSTANTIATION OF THE MAXIMAL PERMISSIBLE CONCENTRATIONS OF TRIETHANOLAMINE, AMMONIUM AND CALCIUM SALTS OF ALKYL-BENZOSULFATES IN WATER BODIES, (IN RUSSIAN), Nauchno-Issledovatel'skii Institut Epidemiologii i Mikrobiologii, Lvov (USSR).

For primary bibliographic entry see Field 5B. W77-03586

WATER QUALITY, PLANKTON AND EUTROPHICATION OF BERGSVATNET, EIKEREN AND FISKUMVATNET, S. NORWAY, (IN NORWEGIAN), Norsk Institutt for Vannforskning, Blindern.

N. Knutzen. Blyttia 32(3), p 145-154, 1974.

Descriptors: *Water quality, *Plankton, *Eutrophication, *Distrophy, *Lakes, *Nutrients, Testing procedures, Chemical analysis, Water sampling, Phosphorus compounds, Algae, Protozoa, Crustaceans, Biological communities. Identifiers: Rotatoria, Criteria, Bergsvatnet, Eikeren, Fiskumvatnet, *Norway.

On the basis of chemical and biological analysis of water samples and net hauls from Aug. 1969, water quality and status with regard to eutrophication were tentatively evaluated. Bergsvatnet was found to be typically dystrophic-eutrophic, whereas Eikeren and Fiskumvatnet were characterized by lower concentrations of P compounds and lower plankton (algae, protozoa, Rotatoria, crustacea) populations (Secchi reading 10 m in Eikeren). Use of plankton indices and indicator species are discussed, the data illustrating the importance of taking into account introduction of species from other lakes and the quantitative aspects of community structure. The future development of the oligotrophic Eikeren (depth 154 m, surface area 26 km²) is considered. Due to the possibly long retention time of the trophogenic layer, it is also possible that Eikeren is more vulnerable than can be deduced from comparisons with nutrient loading in most eutrophic lakes. (The theoretical retention time of the total volume is about 12 yr.) The advantages and difficulties of replacing loading per unit surface area with more relevant criteria are briefly summarized, with emphasis on factors such as length of summer stagnation period, depth of compensation point in relation to the thermocline, and retention time of the productive layer.—Copyright 1976, Biological Abstracts, Inc. W77-03595

5D. Waste Treatment Processes

AN EVALUATION OF AQUEOUS PHASE CATALYTIC OXIDATION, Delaware Univ., Newark. Dept. of Chemical Engineering.

J. R. Katzer, H. H. Ficke, and A. Sadana.

Journal Water Pollution Control Federation, Vol. 48, No. 5, p 920-933, May 1976. 5 fig, 5 tab, 49 ref. OWRT A-027-DEL(3).

Descriptors: *Catalysts, *Phenols, *Oxidation, *Economic feasibility, *Evaluation, *Waste water treatment, Kinetics, Chemical reaction, Industrial wastes, Economics.

Identifiers: *Process design, *Catalytic oxidation, Aqueous phase oxidation.

The literature suggests aqueous-phase catalytic oxidation as a potential wastewater treatment technique but provides insufficient data to evaluate its potential applicability. The complete oxidation of phenol in aqueous solution over supported copper oxide was studied in a one-liter autoclave under conditions of practical interest. Rates were demonstrated to be rapid. Rate data obtained were used to design and evaluate an aqueous-phase catalytic oxidation process for treating wastewater from a catalytic cracking unit and from a coke plant. Aqueous-phase catalytic oxidation appears competitive with other physical-chemical treatment techniques, particularly for wastewater streams containing high concentrations of organics, and appears to warrant further consideration.

W77-03079

TREATMENT OF LIVESTOCK WASTES BY A BARRIRED LANDSCAPE WATER RENOVATION SYSTEM,
Delaware Univ., Newark. Dept. of Agricultural Engineering.

W. F. Ritter, and R. P. Eastburn.
In: Managing Livestock Wastes, (1975). Conference Proceedings of 3rd International Symposium on Livestock Wastes. Published by the American Society of Agricultural Engineers, St. Joseph, Michigan. p 572-575. 8 tab, 4 ref. OWRT A-030-DEL(2).

Descriptors: *Farm wastes, *Nitrogen, *Phosphorus, Chemical oxygen demand, Denitrification, Soil properties, Land disposal, Soil types, Depth, Regression analysis, *Waste water treatment.
Identifiers: Barrired landscape water renovation system.

A laboratory study was conducted to evaluate soil types and depth of soil through which livestock wastes percolate for a barrired landscape water renovation system. Anaerobically treated dairy waste was applied to Matapeake silt loam, Sasafra sandy loam, and Evesboro loamy sand in soil columns of 3, 5, 6 and 8 ft. lengths at loading rates of 1.25 and 2.5 cm per day. In all soil columns total phosphorus was reduced from 44 mg/l to 0.5 mg/l or less. Ammonia removal varied with soil type. Chemical oxygen demand was reduced by 95 percent or more. Laboratory experiments were also conducted to evaluate the changes in levels of dilute acid soluble phosphorus in dairy manure slurries during incubation. The incubated samples were analyzed for dilute acid soluble phosphorus by the Troug 0.002N H₂SO₄ extraction procedure. Linear regression analysis between the Troug phosphorus values and the total phosphorus values derived by summation of the raw material phosphorus levels based on soil type showed that there was a definite and characteristic rate of increase in Troug phosphorus with increasing amounts of dairy manure slurry added. A barrired landscape water renovation system (BLWRS) was used for treating dairy cattle wastes. The BLWRS was 9.1 m x 9.1 m with a depth of 2.4 m. From June 1 to November 31, 1974 the BLWRS reduced the chemical oxygen demand of the liquid dairy waste by 90 percent or more, nitrogen by 85 percent or more, and ortho phosphorus by over 99 percent.

W77-03116

SANITARY-BACTERIOLOGICAL STUDY OF THE EFFECTIVENESS OF DECONTAMINAT-

ING THE SEWAGE OF VOROSHILOVGRAD ON SEWAGE FARMS, (IN RUSSIAN),
Voroshilovgradskii Meditsinskii Institut (USSR).
M. F. Datsenko, and A. A. Loguda.
Gig Sanit 8, p 93-94, 1975.

Descriptors: *Water reuse, Waste water treatment, Biological treatment, Waste disposal, Sewage disposal, E. coli, *Bacteria, Industrial wastes, *Microorganisms, Soils, Irrigation, *Salmonella.

Identifiers: *Shigellas, Ukrainian-Ssr, *USSR(Voroshilovgrad).

Industrial and domestic sewage used for irrigation on sewage farms after biological treatment is characterized by small bacterial numbers, low coli-index and presence of pathogenic microorganisms (salmonellas and shigellas). Application of sewage to soil changes the relationship of indicator microorganisms. Microorganisms of the Escherichia coli group accumulated and the soil biocenose changed on plots irrigated with sewage for 2 yr.—Copyright 1976, Biological Abstracts, Inc.

W77-03128

CHARACTERIZATION AND DEWATERABILITY OF WATER TREATMENT PLANT RESIDUES,
Missouri Univ., Columbia. Dept. of Civil Engineering.

J. T. Novak.
Reprint: Journal of the Environmental Engineering Division, ASCE, Vol 101, No EE1, Proc Paper 11111, February 1975. p. 1-14. 13 fig, 1 tab, 17 ref. OWRT A-061-MO(2), 14-31-0001-3825 and 4025.

Descriptors: *Dewatering, *Waste water treatment, Treatment facilities, *Sludge treatment, Design, Waste identification.
Identifiers: Sand beds, *Sludge characteristics.

An attempt was made to relate internal sludge characteristics to the design of sand beds for sludge dewatering. From the data collected in this study, it appears that sand beds can be a useful sludge dewatering method depending upon specific characteristics of the sludge. The most critical sludge characteristic with regard to the use of sand beds is sufficient compressibility to prevent bed penetration. Other characteristics governing sludge draining and drying rates are the sludge specific resistance and extent of dewatering (solids concentration) obtainable by draining. Since these same characteristics also govern the process yields by other mechanical dewatering methods (10) it can safely be generalized that a sludge which dewateres poorly by mechanical means will be limited in its rate of application to sand beds. These data do, however, provide a means by which sand bed sizing, and therefore cost, can be compared on an equitable basis with other dewatering methods so that optimal selection of a sludge dewatering method can be obtained.

W77-03130

UTILIZATION OF MUNICIPAL WASTE WATER FOR FROTH FLOTATION OF COPPER AND MOLYBDENUM SULFIDES,
Arizona Bureau of Mines, Tucson.

W. W. Fisher.
Arizona Bureau of Mines, Mineral Technology Branch, Circular 17, 1976. 17 p, 13 fig, 11 tab, 7 ref. \$0.75. OWRT A-046-ARIZ(2). 14-34-0001-6003.

Descriptors: *Sewage effluents, *Waste water treatment, *Activated sludge, *Froth flotation, *Ion exchange, *Foam fractionation, Industrial water, *Sulfides.

Identifiers: *Municipal waste water, *Copper ore processing.

Secondary treated sewage effluent was substituted for normal process water in laboratory tests simulating froth flotation of copper sulfide ores. Flotation recovery of copper and molybdenum sulfides showed significant detrimental response to sewage effluent. First, a voluminous, difficultly controlled froth was generated, even in the absence of a frothing agent, that has little mineral carrying ability. Second, sewage effluent caused a small loss in copper recovery and a large loss in molybdenum recovery. The detrimental affects of sewage effluent on flotation were partially overcome by tertiary treatment of the effluent by activated carbon adsorption and anion exchange. The frothing problem was significantly reduced after treating the sewage effluent by foam fractionation. Dilution of the effluent with normal process water resulted in a significant improvement in metal recovery. In addition, the large loss in molybdenum recovery was overcome by using a secondary collector in a combination reagent schedule. However, the secondary collector caused an appreciable loss in copper recovery.

W77-03132

RENOVATION OF MUNICIPAL WASTE-WATER FOR GROUNDWATER RECHARGE BY THE LIVING FILTER METHOD,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.

W. E. Sopper.
In: Biological Control of Water Pollution, p. 269-281, 1976. 11 tab. B-020-PA(17), B-047-PA(9), B-001-PA(13), B-069-PA(4), 14-01-0001-837.

Descriptors: *Sewage effluents, *Groundwater recharge, *Waste water treatment, Conservation, Soil filters, Irrigated lands, *Water reuse, Recycling.

Identifiers: *Renovation, *Municipal wastewater, *Cropland, *Forested areas, *Spray irrigation, *Land application.

Twelve years of research have indicated that the living filter system for renovation and conservation of municipal wastewater is feasible and that the combinations of agronomic and forested areas provide the greatest flexibility in operation. Such a system is more adaptable to small cities and suburbs than to large metropolitan areas because of the availability of open land close to the wastewater treatment plant, although the land area requirement is not a major prohibitive factor. At the recommended level of irrigation, 5 cm per week, only 52 hectares of land would be required to dispose of 4 million liters of wastewater per day. Although large contiguous blocks of agricultural and natural forest land would be the most desirable for efficiency and economy, major metropolitan areas could utilize golf courses, playing fields, forest preserves and parks, greenbelts, scenic parkways, and perhaps even divided highway and beltway medial strips. (See also W77-03148) (Sink-Penn State)

W77-03147

THE KINETICS OF ADSORPTION OF PHENOLS BY GRANULAR ACTIVATED CARBON,
Louisville Univ., Ky. Dept. of Environmental Engineering.

J. S. Zogorski, S. D. Faust, and J. H. Haas, Jr.
Journal of Colloid and Interface Science, Vol. 55, No. 2, May 1976, p 329 - 341. 9 fig, 5 tab, 9 ref. OWRT A-033-NJ(4), 14-01-0001-3830.

Descriptors: *Phenols, Water quality control, *Waste water treatment, *Activated carbon, Kinetics, *Adsorption.

Identifiers: Granular activated carbon, *Kinetics of adsorption.

The removal of phenols from aqueous solution via activated carbon adsorption is a feasible approach to diminishing the concentration of these contaminants in drinking waters. However, both the

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

kinetics of adsorption and the extent of adsorption at equilibrium are dependent on the physical and chemical characteristics of the adsorbate, adsorbent, and experimental system. Results of laboratory scale studies conducted to delineate the effect of such parameters on the kinetics of adsorption of phenols are reported. Parameters evaluated include: hydronium ion concentration, temperature, initial adsorbate concentration, size of adsorbent, competitive adsorption, and type of adsorbate. In addition, the nature of the rate limiting step in the adsorption process of phenols is described.
W77-03149

FIELD MONITORING TECHNIQUES AND DATA ANALYSIS

North Carolina Univ., at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W77-03150

SUITABILITY OF LAGOON EFFLUENTS FOR IRRIGATION IN SOUTH DAKOTA

South Dakota State Univ., Brookings. Dept. of Civil Engineering.
D. Odens.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 216, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, September 1976. 42 p, 5 fig, 6 tab, 8 ref, append. OWRT A-052-SDAK(1). 14-34-0001-6043.

Descriptors: *Effluents, *Oxidation lagoons, *Irrigation water, Brackish water, Standards, Waste water disposal, *South Dakota, *Water quality standards, Waste water treatment, *Water reuse, Waste identification, Classification.

An evaluation and classification of lagoon effluents in South Dakota with respect to their suitability for irrigation and an estimate of the quality of water available was made. Lagoon waters from 20% of the total number of lagoons were sampled and analyzed during July and August. The water quality of the lagoon waters was compared to published water supply quality data for the respective water supply. From these comparisons, empirical relationships were developed permitting the prediction of lagoon water quality on the basis of published water quality data. Using these relationships, all lagoon waters were classified with respect to their suitability for irrigation. Estimates of volume of water available for irrigation was based on area of existing lagoons. Using tentative guidelines for waters suitable for irrigation developed by the Water Resources Institute, approximately 30% of the lagoons contain suitable water. Generally the sodium adsorption-ratio (SAR) was too high but in several instances where the SAR was acceptable the salinity as measured by conductance was unacceptable. The quantity of nitrogen was also evaluated. A mean value of 27 pounds of nitrogen per acre foot of water was found. (Wiersma-South Dakota)
W77-03152

A BUTANE FREEZING PROCESS FOR DEWATERING SLUDGE

New York State Dept. of Environmental Conservation, Albany; and Virginia Polytechnic Inst. and State Univ., Blacksburg.
M. Z. Ali Khan, C. W. Randall, and N. T. Stephens.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 235, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 94, November 1976. 83 p, 36 fig, 8 tab, 41 ref. OWRT A-051-VA(1).

Descriptors: *Activated sludge, *Dewatering, Economic feasibility, Design criteria, Filtration, Settling velocity, *Freezing, Waste water treatment, *Sludge treatment.

Identifiers: Gravity drainage, Specific resistance, Sludge conditioning, *Slurry freezing, Vacuum filtration, *Butane freezing process.

Utilizing butane as the refrigerant, the direct slurry freezing process was employed to condition waste activated sludge in order to improve subsequent dewatering. Using batch and continuous flow laboratory scale reactors, the process was evaluated from both a technical and economical standpoint. The sludge was placed in a closed reactor maintained at slightly less than atmospheric pressure, and liquid butane was bubbled through the sludge from a sparger at the bottom of the reactor. The boiling of the butane resulted in the formation of ice in the sludge but sufficient mixing was induced to prevent solid freezing. The sludge-ice slurry formed was removed, thawed and then dewatered using a variety of techniques. Recovery liquefaction and reuse of butane vapors, and the utilization of latent heat of fusion of the sludge-ice slurry to minimize requirements were evaluated to permit economic analysis. Reactor design requirements were determined. Waste sludges from five separate sources were obtained for experimental purposes. These sources included a municipal treatment plant, a highway reststop package plant, a small plant treating domestic waste from industrial employees, a plant treating pulp and paper waste, and laboratory scale aerobic digesters. Conditioning effectiveness was evaluated by gravity settling, vacuum filtration, and sandbed dewatering techniques. Both Buckner funnel and leaf test experiments, with and without chemical addition were used to evaluate filtration effectiveness. The results showed that the direct slurry freezing process using liquid normal butane as the refrigerant is an extremely effective method for conditioning waste activated sludge to promote settling concentration and dewatering. Furthermore, conditioning can be accomplished without the generation of a high strength supernatant. Important variables affecting slurry freeze conditioning are (1) the length of time the sludge is exposed to slurry freezing conditions; (2) the rate of freezing, which can be controlled by the butane flow rate; and (3) the total solids content of the mixed liquor being conditioned. Analysis and comparison of slurry freezing with other sludge conditioning techniques such as anaerobic digestion, heat treatment, chemical addition and indirect freezing indicate that slurry freeze conditioning produces superior results and can be operated more economically.
W77-03153

DYNAMIC RESPONSE OF FINAL SETTLING TANKS TO TRANSIENT LOADING CONDITIONS

Delaware Univ., Newark. Dept. of Civil Engineering.
D. R. Pizarro.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 359, Price codes: A08 in paper copy, A01 in microfiche. Master of science thesis, June 1976. 141 p, 43 fig, 4 tab, 40 ref, 2 append. OWRT A-025-DEL(4).

Descriptors: Sedimentation, Sludge, Environmental engineering, *Waste water treatment, Suspended solids, Suspensions, Water pollution control, *Model studies, Activated sludge, *Simulation analysis, *Settling basins, Performance.

Identifiers: *Activated sludge process, *Clarification, *Final settling tanks, *Secondary settling tanks, Thickening.

The proposed dynamic model is based on the formation and propagation of concentration discontinuities constrained by the solids flux theory. The continuous thickener was divided into three regions: a uniform clarification zone, a uniform area intermediate region below the feed inlet and above the bottom zone, and a conically-shaped bottom zone for modeling purposes. Verification of the proposed model was accomplished by performing

nonsteady state continuous thickening experiments using a calcium carbonate suspension. Nonsteady state operation was achieved by imposing step transients of the applied flux and the underflow withdrawal rate on a continuous thickener previously maintained at steady state conditions. A comparison of the model simulations and the laboratory data indicated that the concepts employed during the modeling provided a satisfactory description of dynamical conditions. (Dick-Delaware)
W77-03156

BEHAVIOR OF GROUND WATER SUBJECT TO IRRIGATION OF EFFLUENT - A CASE STUDY

Maryland Univ., College Park. Dept. of Civil Engineering.
J. T. Ostrowski.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 330, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, 1976. 121 p, 25 fig, 17 tab, 55 ref, 3 append. OWRT A-031-MD(1). 14-34-001-6021.

Descriptors: *Water reuse, *Groundwater, Irrigation, *Sewage effluents, *Waste water treatment, Model studies, *Water table, Maryland, Application rates, Simulation analysis, Evapotranspiration, Water pollution sources.
Identifiers: *Spray irrigation.

In the design of spray irrigation systems for treatment of sewage, an important variable is the volume of water applied to the soil per specified period of time. In geographical locations with seasonally high water tables, the minimum depth to the water table may be the controlling factor for determining the application rate. With an understanding of the process of moisture distribution in the soil and water consumption by plants, the fluctuations of the groundwater table can be effectively modeled. Two dimensional infiltration, evapotranspiration and moisture distribution in an effluent spray irrigation field is investigated using the equation governing saturated-unsaturated flow in porous media. A finite element formulation of the flow problem is obtained by using the Galerkin variational method. The area under investigation is the oldest operating spray irrigation field of the waste treatment system of the community St. Charles, Charles Co., Md. The spray irrigation field under study has been in operation since 1970 resulting in a steadily increasing water table elevation that has had detrimental effects on the existing vegetation. Fifteen weeks of operation were simulated using the records of application and estimates of evapotranspiration. Results reflect the characteristic seasonal fluctuations of the groundwater table. Water levels were observed in test wells and recorded for use in verification of the simulation model. The procedure may not be presently practical due to the excessive amounts of computation time necessary for effective simulation of the flow system. With subsequent improvements of the model, the efficiency of calculation will be increased, creating a tool which could become quite useful in the planning phase of spray irrigation treatment systems.
W77-03158

A STUDY ON THE APPLICATION OF BIOGROWTH SHEETS TO IMPROVE LAGOON EFFLUENT QUALITY

Missouri Univ., Rolla. Dept. of Civil Engineering.
B. G. Wixson.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 427, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, 1975. 62 p, 15 fig, 13 tab, 31 ref, 2 append. OWRT A-077-MO(1). 14-31-0001-5025&6026.

Descriptors: *Algae, Reservoirs, Water quality, *Oxidation lagoons, *Algal control, Sewage treatment, *Waste water treatment, Chemical oxygen demand, Organic matter.

Identifiers: *Biogrowth partitions, *Algal growth.

Wastewater stabilization lagoons have been employed in small communities where available land and favorable climatic conditions allow for utilization as an economical secondary treatment process. Because of problems associated with the discharge of algae in the effluent, the traditional lagoon may require either some process modifications or additional effluent polishing processes in order to meet local water quality standards. The purpose of this study was to investigate the possibility of increasing attached algal growths on the surfaces of experimental biogrowth sheets to decrease algal discharges and improve the removal efficiency of organic materials as measured by Chemical Oxygen Demand (COD). The application of biogrowth sheets was effective for the enhancement of lagoon stabilization capabilities with the ability to retain large microbial solids, or those with a size larger than the screen openings, from being discharged. However, the practicability and design characteristics of the lagoon modification with the application of biogrowth sheets should be evaluated further with additional field investigations.

W77-03162

LIMING FARMLAND WITH CALCIUM SLUDGE, Missouri Univ., Columbia. Dept. of Civil Engineering. H. J. Winburn.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 221. Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, July 1976. 74 p., 10 fig., 22 tab., 34 ref., append. OWRT B-113-MO(1). USDI-OWRT-14-34-0001-6093.

Descriptors: *Sludge treatment, Lime, Missouri, *Waste water treatment, Farm management, Water reuse, Treatment facilities.
Identifiers: *Calcium sludge.

Lime sludge from the Columbia, Missouri, Water Treatment Plant was tested in soil columns to determine its usefulness as a liming material for acid soils. Plexiglass cylinders (8.9 cm x 45.7 cm long) were used as the soil columns. The soil was as acid (pHs 4.4) Mexico silt loam. Two methods of sludge application were used: (1) sludge was thoroughly mixed with the soil prior to being placed into the column, and (2) sludge was applied directly on the soil surface. Loading rates of 2.02, 4.41, 6.61, 8.82, 11.02, and 13.23g sludge/kg soil (dry solids basis) were used. Distilled water was leached through each column at a rate equivalent to three years normal precipitation. Results indicated that mixing the sludge with the soil produced more uniform and greater levels of change in pHs, exchangeable Ca, K, and P2O5 than the surface applied sludge. With the sludge-soil mixture, a loading 4-6g sludge/kg soil (9-13 metric ton/ha) raised the soil pHs to 6.0-6.5, a range considered optimum for crop production. Associated with this increase in pHs were increases of 58% in exchangeable P2O5, 79% in K and 100% in Ca. The surface spreading of the sludge without incorporation into the soil appeared to be undesirable as this method of application relies upon the slow process of water transport to incorporate sludge into the soil, producing an uneven distribution of sludge and a minimal amount of chemical correction in the soil. (Novak-Missouri).

W77-03163

THE ROTATING BIOLOGICAL FILTER, New South Wales Univ., Kensington (Australia). School of Civil Engineering. D. Barnes, and F. Wilson. Waste Disposal and Water Management in Australia, Vol. 3, No. 4, July-August 1976, p. 3-4, 7-8. 3 fig., 12 ref.

Descriptors: *Sewage treatment, *Biological treatment, *Treatment facilities, Reviews, *Waste water treatment, Water quality standards, *Filters, Filtration.
Identifiers: *Rotating biological filters.

The increasing stringency of effluent discharge standards in many parts of the world has led to a trend away from individual cesspools and septic tanks towards the use of small sewage treatment plants for community use. The rotating biological filter, which relies on biological treatment by micro-organisms growing on a rotating disc partly immersed in the sewage, satisfies most of the requirements for an ideal plant of this kind. The principles of operation, design criteria, applications and performance of this type of installation are reviewed. (CSIRO)

W77-03282

LAND BASED SEWAGE SLUDGE MANAGEMENT ALTERNATIVES FOR LOS ANGELES: EVALUATION AND COMPARISON, California Univ., Los Angeles. School of Architecture and Urban Planning. A. Herson.

June 1976. 127 p., 1 fig., 41 tab., 55 ref., 4 append. (California Water Resources Center Project UCAL-WRC-W-503).

Descriptors: *Waste water treatment, *Sludge disposal, *Municipal wastes, Sludge treatment, Economics, Water law, Irrigation, *California, Sewage sludge, Federal Water Pollution Control Act, *Recycling, Water reuse, Evaluation, Alternative planning, Alternative water use, Management.

Identifiers: *Los Angeles(Calif), Federal Water Pollution Control Act Amendments(1972).

The city of Los Angeles' Hyperion treatment plant currently discharges digested sludge via a seven-mile outfall to Santa Monica Bay. The EPA and the California State Water Resources Control Board have issued directives that ocean discharge of Hyperion sludge be discontinued by the end of 1976 unless the sludge is further treated to meet the discharge limitations established by the SWRCB's Ocean Plan. Since treatment to meet these discharge limitations appears economically infeasible, the city has begun examining alternative means of disposing Hyperion sludge on the land. Many of the negative effects of the agricultural alternative are attributable to the use of secondary effluent for irrigation water. Effluent transportation and disposal account for 58% of the capital costs and 85% of the operating costs of this alternative, and the electricity needed for pumping effluent accounts for almost all (94%) the energy required. Considerable attention should be given to development of alternative irrigation water supplies if sludge is to be applied on an Antelope Valley site. The high total costs of the agricultural alternative, rather than presenting a financing problem for the city, present a cost-effectiveness problem for the state and Federal governments whose grants would cover the additional costs. Much of the high cost of the agricultural alternative is attributable to the agricultural recycling of 55.2 mgd of secondary effluent, a feature not shared by the remaining alternatives.

W77-03289

SYSTEM FOR DEWATERING DILUTE SLURRIES, Environmental Protection Agency, Washington, D. C. T. Lippert. Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 720. Price codes: A02 in paper copy, A01 in microfiche. (Patent Application), Serial No. 520.218, November, 1974. 16 p., 7 fig.

Descriptors: *Sludge treatment, *Dewatering, Equipment, *Design criteria, *Activated sludge, *Waste water treatment, Performance.

An improved system for dewatering dilute slurries such as waste activated sewage sludge is described which allows for higher solids yields by decreasing the solids loading which in turn allows for a proportionally larger decrease in the sludge-belt contact time to effect dewatering. The device includes a spring-loaded or balanced sludge feed tray incorporating an adjustable flow splitter plug along with spring-loaded sludge side guides. A sludge cake compression section design which allows two-position adjustment of the compression roller is employed as a component in the backflushing of the sludge carrier screen using cake effluent. (Kreager-FIRL)

W77-03352

ANALYTICAL STUDIES FOR ASSESSING THE IMPACT OF SANITARY SEWAGE FACILITIES OF DELAWARE COUNTY, OHIO, Enviro Control, Inc., Rockville, Md. Environmental Studies Group.

L. Peltier, M. Lewis, J. Cuneo, G. Shea, and D. Wagoner. Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 672. Price codes: A17 in paper copy, A01 in microfiche. October 24, 1975. 375 p., 63 fig., 54 tab., 202 ref. Environmental Protection Agency Report No. EPA-905/9-76-003.

Descriptors: *Sewage treatment, *Sewers, *Treatment facilities, *Environmental effects, *Water quality, Land use, Interceptor sewers, Construction, Evaluation, *Ohio, *Waste water treatment.

Identifiers: Delaware County(Ohio).

An analysis of the environmental impact of a proposed sanitary sewage treatment facility and interceptor system for Delaware County, Ohio is presented. The environmental impacts of the sewage treatment facility at the chosen site are evaluated in terms of water quality, biology, land use, and aesthetics. The effects on water quality resulting from the proposed action are analyzed in terms of flow conditions, the waste loads introduced into the receiving stream, and existing and future ambient water quality conditions. Water quality problems of temporary duration which are associated with interceptor construction are also examined. (Kreager-FIRL)

W77-03353

RESEARCH NEEDS FOR THE POTABLE REUSE OF MUNICIPAL WASTEWATER, Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering. K. D. Linstedt, and E. R. Bennett.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 138. Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA-600/9-75-007, December, 1975. 202 p., 18 fig., 31 tab., 88 ref.

Descriptors: *Water reuse, *Reclamation, *Municipal wastes, *Waste water treatment, *Reclaimed water, *Potable water, Social aspects, Economics, Organic compounds, Inorganic compounds, Viruses, Research priorities, Toxicity.

Research needs associated with the potable reuse of municipal waste water are discussed. Topics covered include: Environmental Protection Agency research strategy for waste water reuse, current municipal waste water reuse practices, waste water treatment technology for potable reuse, treatment reliability and effluent quality control for potable reuse, socio-economic aspects of water reuse, research needs related to treatment for potable reuse, and the health effects of potable reuse associated with inorganic and organic chemical pollutants as well as with viruses. The identified research is designed to serve as a basis for future Environmental Protection Agency projects dealing with potable reuse of waste water. (Kreager-FIRL)

W77-03356

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, AND CHEMICAL OCEANOGRAPHY. National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5B.
W77-03358

THE IMPACT OF FARGO, NORTH DAKOTA'S WASTE DISCHARGES ON THE INTERSTATE WATERS OF THE RED RIVER OF THE NORTH, SEPTEMBER 1969-APRIL 1970. Federal Water Quality Administration, Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W77-03361

WATER USAGE AND WASTEWATER CHARACTERIZATION AT A CROPS OF ENGINEERS RECREATION AREA. Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W77-03362

CHLORINE DISINFECTION OF TREATED WASTEWATER IN A BAFFLED CONTACT CHAMBER AT LESS THAN 1 C. National Environmental Research Center, College, Alaska. Arctic Environmental Research Lab. R. C. Gordon, C. V. Davenport, and B. H. Reid.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 939. Price codes: A04 in paper copy, A01 in microfiche. Working Paper No. 21, October, 1973. 67 p, 11 fig, 7 tab, 35 ref.

Descriptors: *Disinfection, *Waste water treatment, *Chlorine, *Temperature, *Bacteria, Coliforms, Streptococcus, Effluents, Performance, Evaluation, *Chlorination.

The disinfection of treated waste water at temperatures in the 0-10 C range was studied. Batch treatment of one primary and three secondary effluents with chlorine revealed that effective disinfection was attained in all samples at a temperature of less than 1 C when the actual contact time was 60 min and the final chlorine residual was about 1 mg/liter (orthotolidine). Studies in an 8-compartment, 60-liter contact chamber with flow rates providing 30, 60, and 120 min theoretical contact time revealed that fecal coliforms were essentially destroyed (less than 5/100 milliliter) at temperatures of less than 1 C regardless of the flow rate or chlorine residual maintained. However, reduction of total coliforms to less than 1000/100 milliliter did not occur when the theoretical contact time was 30 min, even when the chlorine residual was 3.3 mg/liter (orthotolidine). For a theoretical contact time of 60 min, nearly 2 mg/liter chlorine residual were required before total coliforms were sufficiently reduced. Only slightly more than 0.5 mg/liter chlorine residual was required for sufficient reduction in total coliforms when the theoretical contact time was 120 min. Reductions in fecal streptococci were generally between those observed for total and fecal coliforms. Raising the temperature from 1 to 10 C did not significantly affect disinfection. (Freager-FIRL)
W77-03363

SHIP-TO-SHORE SEWAGE HOSE HANDLING TESTS. Civil Engineering Lab. (Navy), Port Hueneme, Calif. F. J. Campbell.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 692. Price codes: A05 in paper copy, A01 in

microfiche. Technical Note N-1404, October, 1975. 98 p, 42 fig, 22 tab, 9 ref.

Descriptors: *Waste disposal, *Waste treatment, *Ships, *Transfer, *Design criteria, Evaluation, Performance, Equipment, Hoses.

Procedures and equipment for transferring waste from a ship's holding tank to pier waste-handling facilities were evaluated. The procedures tested included: loading, transporting, connecting, disconnecting, unloading, cleaning, and hose storing. The equipment tested included four types of transport vehicles, plastic and rubber hoses, metal and plastic hose caps and plugs, two powered reels, two types of storage and loading racks, a hose cleaning rack, a hose cleaning apron, and two types of hose supports. The systems selected as best suited to future sewage transfer operations included one for high- and low-load, high-turnover ports and a second for high- and low-load, low-turnover ports. Criteria for determining manpower and equipment requirements for the systems are outlined. (Kreager-FIRL)
W77-03364

ADVANCED TRICKLING FILTER FOR WASTEWATER TREATMENT. Gary Aircraft Corp., San Antonio, Tex. E. W. Leshchber.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A018 318. Price codes: A03 in paper copy, A01 in microfiche. Air Force Report No. AFCEC-TR-75-6, August, 1975. 44 p, 13 fig, 4 tab, 3 ref.

Descriptors: *Trickling filters, *Tertiary treatment, *Waste water treatment, *Biological treatment, *Design criteria, Suspended solids, Biochemical oxygen demand, Equipment, Treatment facilities, Performance, Filtration.

A prototype advanced trickling filter unit for purifying secondary-treated waste water is described. The unit uses a foamed silica medium (GaryGlas) and has a design hydraulic load of 700,000 gallons/day. The design organic load (biochemical oxygen demand) and design solids load are 80 and 60 pounds/1000 cu ft/day, respectively. The unit is capable of reducing effluent biochemical oxygen demand from 29 to 18 milligrams/liter, and reductions in total suspended solids from 64 to 32 milligrams/liter have been achieved. These reductions are sufficient for upgrading existing treatment plants to a level consistent with newer effluent limitations. Detailed design drawings of the trickling filter are provided. (Kreager-FIRL)
W77-03365

AMMONIA REMOVAL FROM WASTEWATER BY LIGAND EXCHANGE. Gillette Co. Research Inst., Rockville, Md. L. M. Smith, G. A. Lyerly, and M. E. Dooley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 418. Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2 - 76-103, April, 1976. 78 p, 21 fig, 13 tab, 27 ref.

Descriptors: *Waste water treatment, *Ion exchange, *Municipal wastes, *Ammonia, *Feasibility, Performance, Evaluation, Waste treatment, Chemical wastes, Alkalinity, Temperature.
Identifiers: *Ligand exchange.

A ligand exchanger consisting of copper ions on a hydrous zirconium oxide ion exchanger was tested in terms of its effectiveness in removing ammonia from secondary-treated municipal waste water and its regeneration capacity. Maximum ammonia uptake by the ligand exchanger occurred at a pH of 10-11 and corresponded to 0.1 millimole ammonia/millimole copper. Steam regeneration was temperature dependent, with maximum regeneration being complete after four column volumes of

condensed steam at 135 C. Repeated loading and regeneration through 25 cycles resulted in no physical particle breakdown nor copper leaching, though some ammonia capacity was lost. Common inorganics and organics exerted a minimal effect on the overall process. Runs with secondary-treated waste water through five cycles were successful, with the exchanger capacity being near that for pure ammonium chloride solution and essentially no loss of capacity occurring. (Kreager-FIRL)
W77-03367

TECHNICAL ASSISTANCE PROJECT GREELEY WASTEWATER TREATMENT FACILITY, GREELEY, COLORADO. JUNE-JULY, 1972. Environmental Protection Agency, Denver, Colo. Technical Support Branch.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 780. Price codes: A02 in paper copy, A01 in microfiche. Publication No. S and A/TSB-4, August, 1972. 21 p, 5 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Activated sludge, *Biochemical oxygen demand, *Optimization, *Trickling filters, Municipal wastes, Industrial wastes, Biological treatment, Performance, Efficiencies, Sludge, Organic compounds.

Identifiers: Solids bulking, Cross connections.

Improvements in the performance of an activated sludge/trickling filter waste water treatment plant handling municipal and industrial wastes in the Greeley, Colorado area are outlined. Modifications to the facility resulted in an increase in 5-day biochemical oxygen demand removal from 40% to 70%. Most of the improvement was due to the discovery of a partially opened valve which provided a cross-connection between the mixed liquor from the activated sludge plant and the final effluent. An improved operational mode for the activated sludge portion of the plant also resulted in better effluent quality. Wasting to the primaries was optimized by monitoring the sludge blanket in the primary clarifiers, and wasting was continued until the primary clarifier blankets began to increase to the point that bulking of solids from the primaries would occur. Thus, all of the solids that could be handled by the system as well as all of the biochemical oxygen demand that could be utilized in solids production were removed. Consistent effluent quality is expected to be difficult to achieve at the plant due to the organic overload received and the plant's inability to handle sludge solids. (Kreager-FIRL)
W77-03368

DECONTAMINATION OF WATER CONTAMINATED WITH POLYCYCLIC AROMATIC HYDROCARBONS (PAH). I. ACTION OF CHLORINE AND OZONE ON PAH DISSOLVED IN DOUBLY DISTILLED AND IN DE-IONIZED WATER. G. S. Sforzolini, A. Savino, S. Monarca, and M. N. Lollini.

Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-TR-2960. Price codes: A02 in paper copy, A01 in microfiche. Oak Ridge National Laboratory Translation No. ORNL-TR-2960, 19 p, 11 tab, 59 ref. Translated from *Igiene Moderna*, Vol. 66, No. 3, p 309-335, 1974.

Descriptors: *Water treatment, *Oxidation, *Ozone, *Chlorine, Organic compounds, Chemical reactions, *Waste water treatment.
Identifiers: *Polycyclic aromatic hydrocarbons, Pyrene, Benzoanthracene, Benzopyrene, Benzo[a]fluoranthene.

The destructive effects of ozone and chlorine on various polycyclic aromatic hydrocarbons in bidistilled or deionized water were investigated.

Ozone proved to be more effective in destroying such compounds as pyrene, 1,2-benzoanthracene, 3,4-benzopyrene, 3,4-benzofluoranthene, and 11,12-benzofluoranthene. Ozone in the form of ozonized air at a concentration of 0.40 mg/liter and with a contact time of 30 min produced stronger destructive effects than aqueous chlorine solutions with a concentration of 2 mg/liter did over the same contact time. Ozone was most effective against 3,4-benzopyrene, with reductions amounting to as much as 100%. Spectrophotometric evidence for the formation of new chloro derivatives of pyrene and 3,4-benzopyrene was observed after their reaction with chlorine. Thus, ozone appears to be preferable to chlorine for the oxidation of polycyclic aromatic hydrocarbons in water. (Kreager-FIRL)

W77-03369

MECHANICAL MOLE BURROWS SEWER TUNNEL.
For primary bibliographic entry see Field 8C.

W77-03397

DUCTILE IRON PIPE SOLVES A TOUGH SEWER PROBLEM AT JIMMERSON CREEK.
For primary bibliographic entry see Field 8G.

W77-03398

INNOVATIONS IN SEWER DESIGN AND CONSTRUCTION.
Richardson (Edward H.) Associates, Inc., Newark, Del.
For primary bibliographic entry see Field 8G.

W77-03399

PRECAUTIONS TO BE TAKEN IN THE CONSTRUCTION AND MAINTENANCE OF WATER SUPPLY AND SEWER SYSTEMS (PRECAUTIONS A PRENDRE DANS LA CONSTRUCTION ET L'ENTRETIEN DES RESEAUX D'AQUEDUC ET D'EGOUT).
For primary bibliographic entry see Field 8G.

W77-03400

INFILTRATION/INFLOW IMPROVEMENTS IN THE OYSTER BAY SEWER DISTRICT.
Holzmacher, McLendon and Murrell, Melville, N. Y.
R. H. Albanese.
Water Pollution Control Federation Highlights, Vol. 13, No. 9, p D1, D6-8, September, 1976. 2 fig.

Descriptors: *Infiltration, *Inflow, *New York, *Sewers, Programs, Public utility districts, Harbors, Topography.
Identifiers: *Infiltration/inflow.

The program used by the Oyster Bay Sewer District of Long Island, New York, to correct their infiltration/inflow problem was discussed. The area is composed of a low-lying harbor and hillier areas to the east, south, and west. The basic system was constructed in 1929 of clay pipe with tar and mortar joints. The original plant was replaced by a trickling filter plant in 1965. In 1966, an infiltration/inflow study was conducted which revealed that the area had a structurally sound system which did not have to be entirely replaced to reduce infiltration/inflow. It was determined that only 20-30% of the system needed repair and a number of significant leaks were repaired. A major salt water lake which discharged salt water into the system was discovered. A modified Phase I study was done in 1974 which indicated that 20-30% of the system contained 75-80% of the total infiltration/inflow. Pilot cleaning indicated that all hydraulic cleaning equipment should have a minimum flow of 227 liters per minute (60 gpm); that sewers being cleaned should be less than one quarter full; that sand traps should be used in all manholes downstream of lines being cleaned; that heavy sand deposits are best removed by bucket

machines; and that 'bee liners' should not be used. A pilot grouting program revealed that air testing of each joint is required in spring areas to prevent the spring from entering the sewer at an adjacent joint; that sealing joints in these areas tends to cause a buildup of ground water which appears as a leak in an adjacent manhole; and that sealing visible leaks under static groundwater conditions eliminates infiltration. (Collins-FIRL)

W77-03401

ACTIVATED SLUDGE WASTE WATER TREATMENT PROCESS - USING SUCCESSION OF AEROBIC AND ANAEROBIC ZONES TO REMOVE NITROGENOUS MATERIAL.
Belgian Patent BE-840-694. Issued April 13, 1976.
Derwent Belgian Patents Abstracts, Vol. X, No. 36, p D3, October 13, 1976.

Descriptors: *Patents, *Waste water treatment, *Activated sludge, *Nitrification, *Nitrogen compounds, Aerobic conditions, Anaerobic conditions, Biological treatment, Nitrates, Nitrites, Chemical reactions, Dissolved oxygen, Nitrogen.

A patent for an activated sludge waste water treatment process that uses a succession of aerobic and anaerobic zones to remove nitrogenous material is described. The process involves the following steps: waste water is mixed with activated sludge and a gas containing free oxygen under aerobic conditions (above 1 milligram/liter of dissolved oxygen); the liquor is then treated under anaerobic conditions (below 0.3 milligrams/liter of dissolved oxygen) to convert nitrates and/or nitrites formed in the aeration stage to nitrogen; the liquor is again treated under aerobic conditions, with part of the treated liquor being returned to the anaerobic stage; the liquor passes to a settling tank from which part of the settled activated sludge is returned to the initial aeration stage; and the purified decanted liquor is then discharged. Unlike prior art processes, the above scheme provides efficient nitrogen removal without either requiring much liquid/solid separations or having an adverse effect on the rate of separation at the decantation stage. (Kreager-FIRL)

W77-03402

SCREENING APPARATUS FOR REMOVAL OF SOLIDS - FROM SEWAGE WITH ROTATING SCREEN AND VERTICAL LIFT FOR RESIDUES.
Belgian Patent BE-841-043. Issued April 23, 1976.
Derwent Belgian Patents Abstracts, Vol. X, No. 37, p D3, October 20, 1976.

Descriptors: *Patents, *Screens, *Waste water treatment, *Solid wastes, *Sewage treatment, Equipment, Design criteria, Separation techniques.

A patent for a screening device that removes solids from sewage or other waste waters is described. The device includes a first cylindrical screen with a vertical axis that is provided with slits or openings through which the liquid flows, with the solids in the liquid becoming deposited thereon and thus separated from the general flow. This screen is also provided with a scraper and can be fixed or rotated by a motor. A second screen located at the side of the first screen which rises above the upper level of the liquid flow is also provided. A lifting plate is associated with this second screen and is moved up and down by a hydraulic ram. When ascending, the plate collects all of the solid matter that has accumulated on the second screen. The solid matter is then pushed by a pressure head and associated piston into a compression chamber. The walls of the latter decrease in diameter towards the outlet, and a spring-loaded articulated plate assists in compressing the solid reject. Screening is continuous and effective. (Kreager-FIRL)

W77-03403

BIOLOGICAL TREATMENT OF SEWAGE WATERS - DEVICE WITH INTERNAL AERATION ZONE.
M. I. Buzovkin, D. D. Zhukov, and D. V. Ivanyukov.
Soviet Patent SU-497-245. Issued March 15, 1976.
Derwent Soviet Inventions Illustrated, Vol. X, No. 38, p D3, October 27, 1976. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Activated sludge, *Aeration, *Waste water treatment, Biological treatment, Equipment, Design criteria, Liquid wastes.

A patent for an activated sludge sewage treatment device that has an internal aeration zone is described. The device consists of a horizontal cylindrical vessel with a coaxial inner cylinder which divides the unit into an outer circular aeration zone and an internal settling zone. The aeration zone with horizontal filtration mesh packing is provided with an inlet for compressed air and an outlet for the disposal of sludge into the settling zone. A round tray for distributing the feed sewage is also provided along with a circular tray for distributing the recirculated activated sludge. The system also has a separating partition and a central collecting tray. (Kreager-FIRL)

W77-03404

SLUDGE COLLECTOR AND LIGHT LIQUID SEPARATOR-FROM SEWAGE WITH TWO TANKS IN SINGLE HOUSING AND COVER.
Belgian Patent BE-841-045. Issued August 16, 1976.
Derwent Belgian Patents Abstracts, Vol. X, No. 37, October, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Sludge treatment, *Sludge disposal, Recycling, Liquid wastes, Separation techniques.
Identifiers: Sludge collectors, Sludge separators.

A patent has been issued for a sludge collector. A unit containing this collector and separator is designed to separate settled materials and light liquids from waste water and sewage. Water flows into the unit and materials which can settle into the collector. The remaining liquid moves under the partition into the separator where materials such as oil and fats rise to the surface to be removed. Then, the water passes under a partition and out of the unit. Separate pipes are used to pump out collected sludge and light liquids. The collector and separator are washed by water after evacuation. (Collins-FIRL)

W77-03405

SEWERAGE TREATMENT APPARATUS.
Waters (Edward) and Sons, Melbourne (Australia). (Assignee).
R. N. Edwards.
Australian Patent 475,357. Issued August 19, 1976.
Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 30, p 3029, August, 1976.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Design criteria, *Equipment, Oxidation, Chemical reactions, Color, Taste, Odor, Phenols.

A patent has been issued for a liquid sewage and waste treatment apparatus which provides biological and chemical oxidation and sterilization, and color, taste, odor, phenol, cyanide, and phosphate reduction of the contaminants. It is characterized by a high degree of oxygen absorption and utilization. The treatment apparatus is composed of an enclosed pressurized chamber with an upper and lower section. Liquid sewage enters the lower section, and oxygen is supplied to the upper one. The liquid sewage is directed in a stream into the upper portion where it is broken into small particles which absorb the oxygen as they drop through the oxygen rich atmosphere. (Collins-FIRL)

W77-03406

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

BIOLOGICAL PURIFICATION OF SEWAGE WATER IN A MULTI-STAGE TREATMENT TANK WITH ROTATING CONTACTOR SURFACES PARTLY IMMERSING IN THE LIQUID.
German Patent DS 2407-423. Issued September 2, 1976. Derwent German Patents Abstracts, Vol. X, No. 37, p D2, October, 1976.

Descriptors: *Patents, *Sewage treatment, *Biological treatment, *Equipment, *Design criteria, Tanks, Liquid wastes, Operation, Treatment facilities, Waste water treatment.

A patent has been issued for a process and apparatus for biological purification of sewage water which features a multi-stage treatment tank with rotating contactor surfaces partly immersed in the liquid. The treatment unit should have a treatment basin/contact element surface area ratio about 0.0049 cu m/sq m. It should never be less than this. Under normal operating conditions, obtaining the optimum effect requires little effort. (Collins-FIRL)
W77-03407

COAGULATION CLARIFYING EFFLUENTS CONTAMINATED WITH COLLOID SUSPENSIONS BY ELECTROPHORESIS AFTER MIXING IN INSOLUBLE METALLIC PARTICLES.
German Patent DS 2461-943. Issued September 9, 1976. Derwent German Patents Abstracts, Vol. X, No. 38, p D2-D3, October, 1976.

Descriptors: *Patents, *Waste water treatment, *Coagulation, *Electrophoresis, *Design criteria, Colloids, Mixing, Metals, Solids removal.

A patent has been issued for a process for coagulation clarifying effluents contaminated with colloid suspensions by electrophoresis following mixture with insoluble metallic particles. The plant for treating dirty water containing colloids by electrophoresis has a suspension, coagulation, and separation zone. An electrode pipe containing electrodes is adjacent to a treating vessel with a cone-shaped upper section and a lower suspension area which is cylindrical and has a conical lower portion. A suction pipe valve, a pipe and a suspension pump connect the interior of the treating vessel to the lower end of the electrode pipe which is connected, by a pipe at its upper end, to the upper end of the separating area. Waste water enters through the tip of the lower conical area of the suspension zone and exits through an outlet at the upper end of the separating zone. (Collins-FIRL)
W77-03408

BIOLOGICAL CONVERTER FOR FAECAL MATTER IN WATER - USING ROTARY TUBES WITH FIBROUS FILLING SUPPORTING THE BACTERIAL CULTURE.
Netherlands Patent NL 7601-914. Issued August 31, 1976. Derwent Netherlands Patents Abstracts, Vol. X, No. 38, p D3, October, 1976.

Descriptors: *Patents, *Biological treatment, *Sewage treatment, *Biodegradation, *Design criteria, Water purification, Tanks, Waste water treatment, Recycling, Water reuse.
Identifiers: Faecal matter.

A patent has been issued for a system for the conversion of fecal matter in water to harmless matter by a biological culture. The major component is a conversion tank which houses perforated tubes. The tubes are on wheels which rotate to allow submersion and complete emergence. The tubes contain a water insoluble material with a large surface area, exposable to both water and air, for bacterial growth. Water which has been purified may be either re-used or released directly into waterways. The water quality is such that it may be used in fish farming or cattle watering. With some chlorination, it may be used as potable water. (Collins-FIRL)
W77-03409

CENTRIFUGE FOR DEWATERING SEWAGE SLUDGE.
Australian Patent 475,847. Issued September 2, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 46, No. 32, p 3240-3241, September 1976.

Descriptors: *Separation techniques, *Centrifugation, *Sewage sludge, *Dewatering, *Patents, *Waste water treatment, *Sewage treatment, *Sludge treatment, Equipment.

A patent has been granted for a centrifuge which drains off sewage sludge. The equipment includes a drum which is tapered towards both ends, a hollow shaft that extends longitudinally within the drum for the passage of sewage sludge, and means to withdraw separated water at one end of the drum and dewatered sludge at the other end. A conveyor screw passes through the drum's interior, along the whole length of the drum. Additionally, a rotatable ejection wheel with blades adapted to accelerate the sludge tangentially to the direction of the wheel is arranged within the drum. Thus, with a wheel in the interior of the drum, at or adjacent to the largest cross-section of the drum, the centrifuge operates and communicates with the interior of the hollow shaft for dewatering and discharging separated sewage. (Kramer-FIRL)
W77-03410

INTEGRAL CIRCULAR WASTEWATER TREATMENT PLANT.

Australian Patent 473,063. Issued June 10, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 46, No. 20, p 1968-1969, June, 1976.

Descriptors: *Waste water treatment, *Patents, *Activated sludge, *Treatment facilities, *Aeration, Aerobic treatment, Aerobic conditions, Oxygen.

A waste water treatment apparatus was patented. It has concentric circular inner and outer walls. The radius of the inner wall is between one quarter and seven tenths the radius of the outer wall. A radial partition extends across the intermediate volume joined to the outer and inner walls, spaced from the first radial partition to form a portion of the intermediate volume bounded by segments of the outer and inner walls from 90 degrees to 330 degrees and a second portion consisting of the remainder of the intermediate volume. There is an aeration zone within the outer wall outside the first arcuate portion, enclosed by a cover. Oxygen gas is introduced in the aeration zone. Another passage introduced activated sludge and feed waste water to the aeration zone. A second aeration zone outside the first arcuate portion is also enclosed by a cover. Oxygen depleted gas discharged from the first aeration zone is introduced to the second aeration zone and mixed with the oxygen-containing gas. A gas vent discharges further oxygen depleted gas from the second aeration zone. The second oxygenated liquor is also discharged from the second aeration zone. Oxygenated liquor is uniformly distributed in the first arcuate portion around the inner wall segments for radial flow across the first arcuate portion. A trough around the upper part of the outer wall segment of the first arcuate portion, discharges clarified water. Activated sludge is collected and removed from the lower part of the first portion and at least part of it is returned to the passage to the first aeration zone. (Snyder-FIRL)
W77-03411

DENVER'S HEADWORKS REFLECTS COMPLEXITY OF SYSTEM.
Hunt (Rodney) and Co., Orange, Mass.
R. W. Henderson.
Water and Wastes Engineering, Vol. 13, No. 10, p 63-64, October, 1976.

Descriptors: *Municipal wastes, *Waste water treatment, *Treatment facilities, Flow, Hydraulics, Pumps, Slide gates, Sluice gates, Aeration, Separation techniques, *Colorado.
Identifiers: *Denver(Colo).

Denver's waste water treatment program is described, with particular emphasis on the complexity of the city's headworks. From Denver's large northern primary treatment plant, influent arrives through two modulating 54 by 54 in sluice gates for secondary treatment; and interceptor lines bring flows from outlying areas in the east and west for both primary and secondary treatment. Incoming flow is metered through a Parshall flume before entering the headworks. It is then aerated and routed through screens and bar channels and subsequently sent to grit basins for full treatment or diverted directly to primary clarifiers. Influent requiring primary treatment passes through 14 Rodney Hunt slide gates to the grit basins, and from there flows are sent to the plant's four primary clarifiers. The liquor flows out of the primary clarifiers to the primary effluent pump station where six pumps provide the boost necessary for the remaining gravity flow processing. From the pumphouse, flow continues to eight 23-foot deep aeration basins and then to secondary clarifiers after which it is discharged to an outfall channel leading to the Platte River. The plant is capable of handling average and peak flows of 168 and 200 million gallons/day, respectively. (Kreager-FIRL)
W77-03412

TOXICITY OF AMMONIA TO ALGAE IN SEWAGE OXIDATION PONDS.
Hebrew Univ., Jerusalem (Israel). Human Environmental Sciences Lab.
A. Abellovich, and Y. Azov.

Applied and Environmental Microbiology, Vol. 31, No. 6, p 801-806, June, 1976. 5 fig, 2 tab, 24 ref.

Descriptors: *Algal poisoning, *Oxidation lagoons, *Ammonia, *Algal toxins, *Sewage treatment, Biological treatment, Kinetics, Oxidation, Alkalinity, Growth rates, Photosynthesis, Stabilization, Nitrogen compounds.
Identifiers: Methylamine, Amines, Chlorella pyrenoidosa, Anacystis nidulans, Plectonema boryanum.

The effects of ammonia on the growth and photosynthesis of axenic cultures of algae in a high-rate sewage oxidation (stabilization) pond were investigated. Ammonia at concentrations above 2.0 millimoles and at pH values over 8.0 inhibited the growth and photosynthesis of *Senedesmus obliquus*, a dominant species in high-rate oxidation ponds. Photosynthesis of *Chlorella pyrenoidosa*, *Anacystis nidulans*, and *Plectonema boryanum* was also susceptible to ammonia inhibition. Methylamine exerted the same effect as ammonia, and its penetration into algal cells was pH dependent. When operated at a 120-hour detention time, the high-rate oxidation pond maintained a steady state with respect to algal growth and oxygen concentration, and the concentration of ammonia did not exceed 1.0 millimoles. Shifting the pond to a 48-hour detention caused an increase in pond water ammonia concentration to 2.5 millimoles, and the pond gradually turned anaerobic. Photosynthesis, which usually elevates the pH of pond water to 9.0-10.0, could not proceed beyond a pH of 7.9 because of the high concentration of ammonia. The dominant factors in determining the oxygen regime and growth rate in oxidation ponds run at short detention times thus appear to be ammonia concentration and pH. (Kreager-FIRL)
W77-03413

THE INFLUENCE OF CARBON-NITROGEN RATIO ON THE CHLORINATION OF MICROBIAL AGGREGATES.
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
W. G. Characklis, and S. T. Dydek.

Water Research, Vol. 10, No. 6, p 515-522, 1976. 10 fig, 12 tab, 27 ref.

Descriptors: *Chlorination, *Oxidation, *Bactericides, *Microbiology, *Slime, Waste water treatment, Chlorine, Carbon, Nitrogen, Suspended solids, Kinetics.
Identifiers: Polysaccharides, Substrates, Microbial films.

Experiments were conducted with attached microbial films in a continuous flow reactor to determine the response of the films to hypochlorite treatment as a function of influent substrate concentration, influent carbon/nitrogen ratio, and shear force at the slime-water interface. Experiments were also conducted in batch systems with suspended organisms grown at varying carbon/nitrogen ratios. Hypochlorite appeared to react with attached microbial films grown at high carbon/nitrogen ratios, causing disruption and partial detachment from the inert growth surface. Hypochlorite also inactivated a portion of the active biomass. Experiments involving mercuric chloride addition indicated that the oxidizing characteristics of hypochlorite rather than its bactericidal effectiveness are responsible for slime removal. Experiments with microbial suspensions revealed that extracellular microbial polysaccharides affect the rate of chlorine demand and to a lesser extent the total chlorine demand in such suspensions. Hypochlorite addition significantly reduced the suspended solids concentration also. (Kreager-FIRL)
W77-03414

COMBINED PROCESS OF PYROLYSIS AND COMBUSTION FOR SLUDGE DISPOSAL.
Kyoto Univ. (Japan). Faculty of Engineering; and Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
N. Takeda, and M. Hiraoka.
Environmental Science and Technology, Vol. 10, No. 12, p 1147-1150, November, 1976. 5 fig, 2 tab, 2 ref.

Descriptors: *Incineration, *Sewage sludge, *Sludge disposal, Municipal wastes, *Waste water treatment, Sludge treatment, Sulfur compounds, Temperature, Treatment facilities.
Identifiers: *Combustion, *Pyrolysis, Hydrocarbons, Water scrubbing.

A double hearth incinerator was used to test the effect of pyrolysis and combustion on sewage sludge. The incinerator was used with a secondary combustion furnace. Sludge supplied through the top of the incinerator, was thermally decomposed and the pyrolysis gases were burnt in the secondary combustion furnace. Some flue gas was passed to a venturi-type scrubber for particulate collection efficiency study. The sludge, a cake of mixed primary and surplus activated sludge from a municipal sewage treatment plant, was combined with heavy metal chlorides to study their behavior. At temperatures as low as 450°C, pyrolysis can reduce feed sludge bulk density by 50%. Low temperature pyrolysis minimizes vaporization of heavy metals in air, while high temperature pyrolysis can produce an air pollution problem. Hydrocarbons produced by pyrolysis can be burned in a secondary combustion furnace to prevent pollution. Low temperature operation did not effectively suppress sulfur oxides, but 40% of the sulfur compounds oxidize to sulfur oxides between 450 and 600°C. Hydrogen chloride can react with alkalis and nitrogen oxides can be controlled by controlling product gases of pyrolysis. A temperature of 600°C minimized nitrogen oxide emissions. Dust collection was effected through water scrubbing. (Collins-FIRL)
W77-03415

SLUDGE DEWATERING PILOT PLANT DESIGN, PART I.
New Jersey Inst. of Tech., Trenton. Dept. of Civil and Environmental Engineering.

P. N. Cheremisinoff, and M. A. Maglio, Jr.
Water and Sewage Works, Vol. 123, No. 11, p 90-95, November, 1976. 4 fig, 12 tab.

Descriptors: *Sludge treatment, *Industrial wastes, *Design criteria, *Pilot plants, Heat treatment, Dewatering, Treatment facilities, Chemical precipitation, Coagulation, Sludge disposal.
Identifiers: Chemical treatment.

Design considerations for a sludge dewatering plant were discussed in part one of a two-part article. First, the pilot plant was designed to handle secondary sludges as well as industrial sludges. Wide variations in sludge compositions at different plants and industries made this a necessity. Treatment stages included chemical treatment, heat treatment, and the dewatering process. The addition of chemicals such as lime to destroy pathogenic bacteria, and ferric chloride and ferrous sulfate to provide charge neutralization and coagulation was discussed. Heat treatment was considered as a means of improving sludge dewatering properties. Finally, a dewatering process was presented to deal with such factors as particle density, particle size, particle charge, degree of hydration, and compressibility. (Collins-FIRL)
W77-03416

DORR-OLIVER TO MARKET ECOLOTROL WASTE WATER TREATMENT PROCESS.
Chemical Engineering Progress, Vol. 72, No. 10, p 104, October, 1976.

Descriptors: *Waste water treatment, *Biological treatment, *Biochemical oxygen demand, *Activated sludge, *Nitrification, *Denitrification, Ammonia, Nitrogen, Microorganisms, Equipment.
Identifiers: Fluidized bed reactors.

A process which removes carbonaceous BOD (activated sludge), nitrifies ammonia nitrogen to nitrate form, and denitrifies nitrates to nitrogen was introduced. Fluidized bed reactors using microorganism-saturated media with high biomass concentration proved more economical than the more common concrete tanks or basins. The Hy-Flo system passes waste water up through a reactor partially filled with sand or a similar substance. After fluidization, the media becomes a vast surface on which microorganisms become attached. Biomass and biological reactions are like those of other biological treatment systems. In 15 min, 85-90% of carbonaceous BOD can be removed. Ninety percent nitrification is obtained in 18 minutes. Denitrification (99+%) can be achieved in 6 minutes. A pre-engineered equipment package will be developed for smaller plants. (Collins-FIRL)
W77-03417

HIGH GRADIENT MAGNETIC FILTRATION.
Sala Magnetics, Inc., Cambridge, Mass.
J. R. Harland, J. A. Obertuffer, and D. J. Goldstein.
Chemical Engineering Progress, Vol. 72, No. 10, p 79-80, October, 1976. 1 fig, 2 tab, 7 ref.

Descriptors: *Waste water treatment, *Filtration, *Filters, Equipment, *Pilot plants, Sewage treatment, Economics, Costs, Operating costs, Waste treatment, Sewage treatment.
Identifiers: *Magnetic filtration.

Magnetic filtration may be used in waste treatment in two areas. First, it can directly filter suspended magnetic particles. The process may also remove non-magnetic materials by a seeding method. A simple high gradient magnetic separator is composed of a fibrous ferromagnetic packing or matrix filter bed which is externally magnetized. Economics of this method depend upon the form of the ferromagnetic matrix and the efficiency of the magnetic field. Contaminated material is passed through the filter and magnetic materials

are trapped on the matrix fibers. In cases of non-magnetic suspended solids, a magnetic seed material, such as magnetite, is added to the water which is then flocculated to allow non-magnetic impurities to adhere to the seed material. Removal then occurs as with magnetic impurity removal. This technique has worked well in removing microbial cells and most viruses in treatment of raw sewage. Design features are given for a pilot plant and a total operating cost estimate of \$0.10 to 0.15/1,000 gallons is given for a system which processes 27,000 gallons per minute of waste water. (Collins-FIRL)
W77-03418

SLUDGE INCINERATION.
For primary bibliographic entry see Field 5E.
W77-03419

WASTE-TREATMENT 'FARM' HARVESTS FIRMS.
Chemical Week, Vol. 119, No. 11, p 51-52, September, 1976.

Descriptors: *Tertiary treatment, *Irrigation, *Municipal wastes, *Industrial wastes, *Waste water treatment, Aeration, Percolation, Biochemical oxygen demand, Nitrogen, Phosphorus, Odor, Pulp and paper industry, Economics, Fertilizers, Crop production, Michigan, Symbiosis, *Water reuse.

A waste water treatment farm that uses partially treated waste water to irrigate and fertilize 4500 acres of corn is described. Waste water is collected from industrial sources and 13 municipal systems and is piped for distances up to 11 miles to the site. After biological treatment (aeration and settling) and percolation through the soil, the treated water has a biochemical oxygen demand value of 2.7 ppm and phosphorus and nitrogen levels of 0.02 ppm and 2 ppm, respectively. During the winter, incoming waste water is stored in a 850-acre lagoon with over 5-billion gallon capacity. The return from the sale of crops at the farm is offsetting the treatment costs which are surprisingly low for tertiary treatment. Users are charged 22 cents/1000 gallons, with an additional 2 cents/1000 gallons in acreage assessments by municipalities. The main problem encountered with this waste water treatment farm which is located in Muskegon, Michigan is the generation of odor from paper mill wastes. (Kreager-FIRL)
W77-03420

USE OF SLUDGE LEFT AFTER WASTE WATER DECONTAMINATION AS A FERTILIZER OR SOIL CONDITIONER (LES BOUES DE DECONTAMINATION D'EAU RESIDUAIRES UTILISEES COMME FERTILISANT OU COMME CONDITIONNEUR DE SOLS).
S. De Haan.
Bulletin d'Information, Institut Belge pour l'Amelioration de la Betterave-Tiende (Belgium), Vol. 11, No. 7, p 60-62, 1976. 1 tab.

Descriptors: *Waste water treatment, *Sludge disposal, Metals, Lime, Recycling.
Identifiers: Netherlands, Land application.

The average inhabitant in the Netherlands produces 60 cubic meters of waste water per year, containing 40 kg of solid organic matter and 30 kg of mineral material. Secondary (microbial) sludge contains large numbers of microorganisms, which are very rich in nitrogen and phosphorus. This sludge is customarily dephosphated with ferric chloride or aluminum sulfate and stabilized by addition of thickeners. After maturation for one year, moist sludge develops very favorable physical properties. It is then dewatered and pre-conditioned, and sterilized to destroy pathogenic organisms and worm eggs before agricultural or horticultural use. The effect of nitrogen is predominant for sludge in the first year of application, and

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

is generally positive. Undesirable effects of heavy metals can be avoided by addition of lime. Percolation water from sludge is heavily contaminated. It is recommended that not more than 2 tons of municipal sludge/ha/yr, calculated as dry weight, be added to soil. (Text in French) (Henson-FIRL) W77-03421

SPECIFIC ROLE OF LIME IN MUNICIPAL WASTE WATER TREATMENT-EXPECTATIONS AND REALITY (DIE SPEZIFISCHE ROLLE DES KALKS IN DER KOMMUNALEN ABWASSERREINIGUNG-ERWARTUNGEN UND REALITÄTEN), R. Kickuth.

Forum Umwelt Hygiene, Vol. 27, No. 2, p 300-305, September, 1976. 2 fig, 1 tab, 13 ref.

Descriptors: *Waste water treatment, *Lime, *Municipal wastes, *Phosphates, *Water purification, Recycling.
Identifiers: Federal Republic of Germany.

Addition of lime directly to municipal waste water has been proposed for two distinct purposes: waste water purification and phosphate recovery. However, reaction of phosphate with lime can also be carried out in a separate process following precipitation with Fe or Al, and therefore, there is no compelling reason for the use of lime in the actual clarification process. Hydrolytic decomposition of iron and aluminum phosphates by lime would have to be carried out within the sludge loop of the municipal water system. Addition of lime to municipal clarified sludges containing iron phosphate to produce equilibrium pH values of 11 would result in 90-95% conversion of the iron-bound phosphate to usable calcium phosphate. A maximum of 2 g calcium hydroxide would be required for each gram of iron in the sludge, for an average addition level of 500 g calcium hydroxide per cubic meter of sludge. The sludge volume in a municipal sewage treatment system amounts to about 1% of the waste water volume, for a daily municipal clarified sludge volume of about 150,000 cubic meters in the Federal Republic of Germany. Therefore, about 27,375 tons of calcium hydroxide per annum would be required for the conversion of iron phosphates. (Text in French) (Henson-FIRL) W77-03422

ORIGIN OF NITROGEN POLLUTION IN SURFACE AND WASTE WATERS (ORIGINES DES POLLUTIONS AZOTES DANS LES EAUX SUPERFICIELLES ET LES EAUX USEES), J. Bebin.

Techniques et Sciences Municipales—L'eau, 71(8/9):347-362, August/September, 1976. 11 fig, 13 tab, 18 ref.

Descriptors: *Nitrogen, *Pollution abatement, *Waste water treatment, *Sewage treatment, *Nitrification, Surface waters, Biochemical oxygen demand, Oxygenation, Water pollution control.

New developments are reported in the elimination of the problem of nitrogen pollution in both surface waters and waste waters. The nitrogen concentration has increased in surface waters over the past few years. The major sources of the increase are domestic sewage and industrial waste waters. Nitrogen pollution must be abated in sewage treatment plants, in order to avoid further eutrophication of rivers. Nitrification may be achieved quite simply by oxygenation, followed by the use of an anoxic tank. Sewage can then be used as a source of carbon, allowing both denitrification and further reductions in biochemical oxygen demand. (Kramer-FIRL) W77-03423

SLUDGE - WHERE WILL WE PUT IT, CH2M/Hill, Corvallis, Oreg.

For primary bibliographic entry see Field 5E. W77-03424

ACTIVATED CARBON FROM ACTIVATED SLUDGE,

Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemistry. H. Bosch, G. J. Kleerebezem, and P. Mars. Journal Water Pollution Control Federation, Vol. 48, No. 3, p 551-561, March, 1976. 5 fig, 2 tab, 21 ref.

Descriptors: *Activated carbon, *Activated sludge, *Adsorption, Oxidation, Filtration, Dewatering, Centrifugation, Pores, *Waste water treatment, *Biological treatment.

Investigations were conducted to determine if activated carbon with a sufficiently high surface area can be prepared from sludge; if this active carbon has necessary adsorption qualities; if the presence of carbon particles affects the rate and/or degree of biological oxidation; and if the active carbon acts as a filter aid in dewatering. Primary and secondary sludges were studied. The samples were centrifuged, dried, and the sludge carbonized in nitrogen gas. The samples were activated with steam. Pore structure, adsorption capacity, and the influence of active carbon on biological oxidation and floc structure in an activated sludge tank were investigated. This process facilitated regeneration of powdered carbon and the addition of commercial powdered carbon with a higher adsorption capacity may be beneficial. Adsorption is faster and more effective and an extra separator for carbon used in the tertiary purification is unnecessary. Salts will be partly insoluble due to the regeneration procedure. (Collins-FIRL) W77-03425

DESIGN AND CONTROL OF NITRIFYING ACTIVATED SLUDGE SYSTEMS,

Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering. A. W. Lawrence, and C. G. Brown. Journal Water Pollution Control Federation, Vol. 48, No. 7, p 1779-1803, July, 1976. 13 fig, 8 tab, 20 ref, 1 append.

Descriptors: *Kinetics, *Nitrification, *Activated sludge, *Sludge treatment, Temperature, Oxygen demand, *Waste water treatment, Trickling filters. Identifiers: Oxygen uptake.

A pilot study was conducted to determine criteria for the application of microbial growth kinetics and continuous-culture theory in the nitrification of activated sludge. A comparison of one- and two-sludge nitrifying systems was also made. This activity was done to aid the upgrading of a regional trickling filter plant in Cheektowaga, New York. Laboratory tests at 8 and 20°C investigated temperature effects on nitrification; process stability against changing hydraulic, carbonaceous, and nitrogenous loads; and the use of biological SRT (sludge age) and controlled solids wasting. Steady-flow studies, reactor performance, settling characteristics, and microbial oxygen uptake, were considered. Experimental results indicated no essential differences in efficiency and performance of one- and two-sludge nitrifying systems operated under the same growth and temperature conditions; that nitrification can be controlled by applying biological solids retention time concepts and appropriate sludge-wasting policies; that nitrification is practically complete at temperatures of 8 and 20°C with biological solids retention times of 20 and 10 days, respectively; and that maximum growth rates of nitrifying bacterial at 8 and 20°C is approximately 0.25 and 0.5 days, respectively. Nitrification is definitely temperature dependent and use of either the one- or two-sludge systems should depend upon economic considerations. (Collins-FIRL) W77-03426

CONCENTRIC WASTE-TREATMENT PLANT SAVES LAND, CUTS COST,

Stearns and Wheler, Cazenovia, N.Y. S. G. Brisbin.

Civil Engineering-ASCE, Vol. 46, No. 2, p 74-76, February, 1976. 2 fig.

Descriptors: *Waste water treatment, *Biochemical oxygen demand, *Treatment facilities, *Waste treatment, *Land use, Landfills, Costs, New York, Weather, Aeration, Sludge disposal. Identifiers: Imhoff treatment, Land application.

In 1969 the village of Camden, New York, located in the cold snow belt region immediately north of Oneida Lake, recognized that its waste water treatment facilities were inadequate and began planning the needed facility. The Village wanted a plant located near its existing Imhoff-type primary treatment plant that would be reliable, require a minimum of attention, be simple to operate, be compatible with the harsh winter conditions, be economical and easy to maintain. An extended aeration type process was selected, using three circular concentric tanks, the outer two for aeration and the central circle utilizing a covered final settling tank. It was designed to treat waste from an equivalent population of 4700, with an average flow of 800,000 gallons per day and a peak flow of two million gallons per day, and to provide 85% biochemical oxygen demand (BOD) and suspended solids reduction at average flow. The treatment process is relatively simple. Excess sludge is removed routinely from the system by pumping from the final clarifier to sludge holding and drying beds, then disposed of at a landfill or used as soil conditioner. Emergency generation equipment works automatically, when needed, to guarantee continued operation and treatment. Replacing portions of leaking sewers resulted in considerably reduced flows. Operating results indicate over 90% removals of all monitored pollutants. This plant cost only 60% of the cost of a conventional plant. (Snyder-FIRL) W77-03427

THE ROTOR AERATOR: GROWING USE IN U.S. WASTE-TREATMENT PLANTS.

Civil Engineering-ASCE, Vol. 46, No. 2, p 76-77, February, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Aeration, Aerobic treatment, Waste treatment, Aerobic conditions, Dissolved oxygen. Identifiers: *Rotor aerators.

The rotor aerator was developed in the early 1950's as a low-cost method of sewage treatment. It has been used in sewage treatment plants ranging in size from 20,000 gpd to 40 mgd. In most cases, the rotor aerator is installed in an oxidation ditch with a race-track geometry. Using a ditch 10 to 16 ft deep was made possible by installing a baffle just downstream of the rotor aerator. When the aerated stream strikes the baffle, it plunges to the bottom of the ditch, then up again. Diffuser aerators have only about half the oxygen transfer efficiency of mechanical surface aerators. Turbine aerators have a more limited radius of influence than the rotor aerator. One-way movement around the oxidation ditch, with two rotor aerators 180 degrees apart, has an important advantage in nitrogen removal. The dissolved oxygen concentration tapers off downstream of the reactor. When it falls below 0.5 mg/liter, bacteria attack the nitrate ion, releasing both nitrogen and oxygen as a gas. (Snyder-FIRL) W77-03428

ELEMENTAL DISTRIBUTION DIAGRAMS FOR BIOLOGICAL WASTEWATER TREATMENT,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering. J. H. Sherrard, and L. D. Benefield. Journal Water Pollution Control Federation, Vol. 48, No. 3, p 562-569, March, 1976. 7 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Analytical techniques, *Treatment facilities, Carbon, Nitrogen, Phosphorus, Kinetics, Microorganisms, Distribution.

A method is illustrated that may be used to account for waste water carbon, nitrogen, and phosphorus and to specify the form in which each may be found after treatment. In the activated sludge process, the organic components of the waste are partially oxidized by microorganisms, after which the microbial mass is separated as sludge by settling from the supernatant liquid. The supernatant may undergo further treatment, and the concentrated microbial mass is recycled to the aeration chamber. Once a waste water has been defined on a biokinetic basis, effluent quality, sludge production, nitrification, and other parameters may be predicted based on the concept of mean cell residence time. A laboratory study is required to define the biokinetic constants for carbon removal and nitrification to plot the forms of carbon, nitrogen, and phosphorus as a function of mean cell residence time as they appear after treatment. Determining the distribution of phosphorus as a function of mean cell residence time is relatively simple, because phosphorus is either incorporated into the sludge produced in the carbon removal and nitrification steps or it will pass directly into the effluent. It is suggested that several uses be made of the graphical relationships involved, the most important being a realization of what a process can or cannot do under a specific operating condition. It is suggested that elemental percentage distribution diagrams may be easily determined for a specific waste water for a variety of process operating conditions that may exist at a treatment plant. (Snyder-FIRL)
W77-03429

FACTORS AFFECTING POWDERED CARBON TREATMENT OF A MUNICIPAL WASTE-WATER,

Envirotech Corp., Salt Lake City, Utah. Eimco-BSP Div.
R. N. Wallace, and D. E. Burns.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 511-519, March, 1976. 7 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Treatment facilities, *Carbon, *Waste water(Pollution), Municipal wastes, Pilot plants, Organic compounds.
Identifiers: *Carbon treatment, Powdered carbon.

A nominal 50-gpm pilot plant operated for about 15 months using carbon treatment to remove soluble organics from waste water. To quantify pertinent system variables, periods of reasonably stable carbon system operation and performance were identified by plotting effluent quality, carbon dosage, and carbon system solids retention time for each day of pilot plant operation. The Freundlich adsorption model is used to evaluate the effect of treatment variables on carbon system response. Organic removal in the pilot plant carbon system is considerably higher than predicted for adsorption by laboratory tests, reinforcing the thesis that a removal mechanism in addition existed in the carbon contactor. Treatment effects are analyzed, including number of stages, chemical pretreatment effects, biological effects, and regeneration effects. In contrast to a previous study, which indicated that adsorption and biological removal were operative in the first stage and predominantly adsorption removal in the second, adsorption and biological removal apparently were operative in both stages. Because it is impossible to model practically or predict theoretically carbon system response, pilot plant studies for developing sizing criteria for powdered carbon systems are strongly recommended. It seems that organic removals for two-stage counter-current treatment using powdered carbon are higher than those for single-stage treatment, but single-stage carbon

treatment might be economically justified for relatively weak waste water. (Snyder-FIRL)
W77-03430

U. S. AIR FORCE GREENS COLORADO.

Water and Sewage Works, Vol 123, No 8, p 62-64, August, 1976. 7 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Biochemical oxygen demand, *Treatment facilities, Colorado, Military reservations, Effluent, Recycling, *Water reuse.

Final polishing of effluent from the United States Air Force Academy's sewage treatment plant enables treated water to be recycled and used to irrigate the campus. Recycling water makes it possible to produce greenery unusual in this semi-arid region. Up to 20% of the wastes coming into the plant emanate from dining halls as garbage grindings, making the sewage twice as strong as what would normally appear in Colorado Springs. The plant uses primary sedimentation, industrial grit removal with full aeration, primary and secondary treatment filters, and intermediate clarifiers. Wastes are further purified in a four-stage reservoir system offering retention periods of 30 to 60 days and producing biochemical oxygen demand (BOD) that compares favorably with that of running streams. The water is used to irrigate lawns and shrubbery. Operation of the plant began in 1958. (Snyder-FIRL)
W77-03431

SHELTERS BOOST WINTER TREATMENT EFFICIENCIES,

Anderson-Nichols and Co., Inc., Boston, Mass.
L. W. Long.
Water and Sewage Works, Vol 123, No 8, p 32-33, August, 1976. 2 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Winter, Efficiencies, Materials, Maine.

Prefabricated, aluminum and fiberglass-plastic shelters around Mount Desert, Maine, sewage treatment facilities have resulted in a steadier demand in aeration requirements, energy savings, and less equipment wear in winter operation. All treatment plants on Mount Desert Island are of the secondary treatment type, utilizing extended aeration. The type of panels used in the shelters encourages heat from the sun to build up. At two plants, each made up of two aerator units, the seasonal load is sufficiently reduced in the winter that only one unit is needed, and only one was covered. Side wall panels are hinged so that they can be opened in summer for greater air circulation and maintenance. The steadier environment has resulted in less use of heaters. It is estimated that the energy savings alone could enable the shelters to pay for themselves. (Snyder-FIRL)
W77-03432

THE APPLICATION OF THE FOAM FRACTIONATION PROCESS TO THE REMOVAL OF VIRUSES. PART I. THE PRODUCTION OF A MATHEMATICAL MODEL TO PREDICT THE EFFICIENCY OF VIRUS REMOVAL.

Trent Polytechnic, Nottingham (England). Dept. of Life Sciences.
M. D. Guy, J. D. McIver, and M. J. Lewis.
Water Research, Vol 10, No 8, p 737-744, 1976. 2 fig, 3 tab, 4 ref.

Descriptors: Laboratory tests, *Waste water treatment, Analytical techniques, *Treatment facilities, *Foam fractionation, *Bacteriophage, Mathematical models, Efficiencies, Surfactants, *Viruses, Path of pollutants, Forecasting.
Identifiers: *Virus removal.

A laboratory scale foam fractionation plant was used to study factors affecting the removal of

viruses. Viruses were represented by Escherichia coli Bacteriophage MS-2, and the surfactant was Arquad T50, a cationic agent composed of a blend alkyl quaternary ammonium chlorides. The level of Arquad T50 likely to be used in foam fractionation is toxic to Bacteriophage MS-2. If the water to be treated is mixed with the surfactant for a period before fractionation, the percentage of such bacteriophages that would be destroyed could be predicted mathematically. The removal of Enteroviruses with this cationic surfactant is not affected by toxicity. Virus removal depends on their adsorption to the surfactant and their physical removal as free virus particles entrapped in the interstitial liquid. (Snyder-FIRL)
W77-03433

EFFLUENT VARIABILITY ESTIMATION FOR COMPLETE-MIX ACTIVATED SLUDGE TREATMENT SYSTEMS,

Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
V. Novotny, A. J. Engle, Jr., and P. Majgani.
Water Research, Vol 10, No 8, p 699-709, 1976. 14 fig, 1 tab, 14 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, Analytical techniques, *Treatment facilities, Effluents, Variability, Estimating, Mixing.

To meet effluent guidelines, it is necessary to quantitatively define activated sludge behavior with respect to transient loading conditions. A frequency transform technique was employed for developing mathematical models describing the waste water influent variability removal for completely-mixed biological treatment plants. The influent variability was simulated by a pulse function, a step function, a harmonic function, and a random signal. A principle of superposition can be applied for more complex influent variation patterns. The solution was presented for waste water treatment systems consisting of one mixed basin with decay or of two mixed basins, second with decay. A practical design equation was developed. Laboratory experiments were performed in an effort to verify the design equations. First, the steady state substrate removal coefficient was evaluated in a bench-scale study. Refinery waste water was used due to its relatively slow degradability. For random influent variation, input concentrations were changed at 2 hr intervals using a random number table. A pulse function was introduced by a 5 min application of a sample with 4200 mg/liter total organic carbon (TOC) followed by a return to the original 480 mg/liter TOC. A step function input was produced by a sudden 480 mg/liter increase in TOC concentration which was maintained. While some deviation from the theoretical model was indicated for random inputs, general agreement was within 5%. Both pulse and step function response showed excellent agreement with the theoretical equations, with observed error of 13 and 2%, respectively. (Snyder-FIRL)
W77-03434

BEHAVIOUR IN CONVENTIONAL SEWAGE PURIFICATION PROCESSES OF COLIFORM BACTERIA WITH TRANSFERABLE OR NON-TRANSFERABLE DRUG-RESISTANCE,

National Inst. for Water Research, Pretoria, South Africa.
W. O. K. Grabow, M. van Zyl, and O. W. Prozesky.
Water Research, Vol 10, No 8, p 717-723, 1976. 6 tab, 39 ref.

Descriptors: *Bacteria, *Waste water treatment, *Sewage treatment, *Biological treatment, *Sewerage, Analytical techniques, Treatment facilities, Filtration, Sedimentation, Sampling, E coli.
Identifiers: Drug-resistance.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

The effect of biofiltration, sedimentation, chlorination, and sand filtration on coliform bacteria with transferable (R+) or nontransferable (R-) resistance to five common drugs was investigated. Grab samples were taken at a municipal sewage works after conventional primary sedimentation, biofiltration and secondary sedimentation, about 10 min after addition of chlorine to a total chlorine content of about 4 mg/liter, and after rapid sand filtration of the chlorinated effluent. The percentage of R- coliforms resistant to ampicillin (A), chloramphenicol (C), or streptomycin (S), but not kanamycin (K) or tetracycline (T) was slightly reduced. On the average the percentage of R+ coliforms resistant to one or more of these drugs was reduced by about 50%, mainly by biofiltration and sand filtration. The ratio of transferable to nontransferable resistance for drugs other than streptomycin increased during secondary sedimentation and chlorination. R factor transfer may occur in water. Rapid passage over stony surfaces in biological and sand filters is unfavorable for conjugation, while R factor transfer can be expected under the relatively stagnant conditions in sedimentation and chlorination tanks. The incidence of R factors conferring resistance to all five drugs simultaneously increased through treatment. The incidence of *Escherichia coli* among R+ coliforms did not exceed 50%. The limited effect of conventional sewage purification on the incidence of drug resistance in bacteria supports the view that sewage should be treated by more advanced methods prior to discharge. (Snyder-FIRL)
W77-03435

CORRELATION BETWEEN BOD - TOC - TOD (ZUSAMMENHANG ZWISCHEN BSE - TOC - TOD),
K. Offhaus.
Vom Wasser, Vol. 46, p 35-63, 1976. 11 fig, 3 tab, 8 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Activated sludge, *Biochemical oxygen demand, *Chemical oxygen demand, Treatment facilities, Organic compounds, Carbon. Identifiers: *Total organic carbon, Total oxygen demand.

Total organic carbon (TOC), biochemical oxygen demand (BOD), chemical oxygen demand (COD), and total oxygen demand (TOD) are important parameters for examining waste water. The difference in capacity for peptone degradation between a mixed culture and a *Pseudomonas putida* mono-culture is discussed in light of experiments performed. Using the effluent of a laboratory scale activated sludge plant, it can be demonstrated that *Pseudomonas* displays no stronger degradation capabilities than a mixed culture. The varying efficiency of the TOC and COD analysis, particularly with regard to carboxy-carbon, is mentioned. For oxidation of this type of carbon compounds, no external source of oxygen is provided which the carbon dioxide determines in TOC analysis. Extensive experiments indicate that in conventional COD determination nitrogen is not oxidized, in contrast with the TOD method with the Swing TOD analyzer where nitrogen is transformed into nitrous oxide. The correlations between COD, BOD, and TOC are discussed. The TOC value will, under certain conditions, allow BOD and COD to be rather precisely estimated. To reliably correlate BOD and TOC, numerous BOD determinations are required. (Snyder-FIRL)
W77-03436

SEWAGE PLANT FOR BRITISH VIRGIN ISLANDS.
Reinforced Plastics, Vol. 20, No. 5, p 138, May, 1976.

Descriptors: *Sewage treatment, *Treatment facilities, Plastics, Aeration, Scum, Bubbles, Construction, Activated sludge, Mixing, Equipment, *Waste water treatment.

Identifiers: *Virgin Islands(British), Glass fiber reinforced plastics.

A complete sewage treatment plant made of glass fiber reinforced plastics was designed for the Virgin Islands. The structure has the advantages of being corrosion resistant and light weight. It was designed to treat a 25,000 gpd dry weather flow of domestic sewage. The system consists of a GRP tank divided into an aeration chamber and an upward flow type settling chamber. A surface scum removal system avoids the problem of floating solids. Sewage enters the aeration chamber, is mixed with activated sludge, aerated, and transferred to the settling chamber. Solids from activated sludge settle to chamber base and return to the aeration chamber to be mixed with incoming sewage. Clarified effluent is discharged over a castellated weir. Air enters the aeration chamber through coarse bubble aerators. Construction is such that additional units can be added as needed. This system, for a population of under 500, is rectangular; a circular arrangement is recommended for populations of 800 or more. (Collins-FIRL)
W77-03437

LARGE FACTORY-BUILT PUMP STATION BEGINS OPERATION.
For primary bibliographic entry see Field 8C.
W77-03438

'GIVE FLOTATION A TRY' WAS CHALLENGED.
For primary bibliographic entry see Field 5F.
W77-03439

SMALL VILLAGE GETS ADVANCED TREATMENT.
The American City and County, Vol. 91, No. 8, p 69, August, 1976.

Descriptors: *Tertiary treatment, *Treatment facilities, *Sewage treatment, Flow rates, *Filtration, Oxidation, Aerobic digestion, Biochemical oxygen demand, Suspended solids, Flocculation, *Waste water treatment, Pennsylvania, Aeration.
Identifiers: *Extended aeration, Phosphorus removal, Sand filters.

The new sewage treatment plant installed at the small village of McAlisterville, Pennsylvania, is an extended aeration plant. Due to the low flow rate of the receiving stream from April to October, 95% BOD removal is required. During the rest of the year, 90% BOD removal is achieved, meeting Pennsylvania's Department of Environmental Resources requirements. Design features include twin circular oxidation ditches with a common wall into which pumped wastes are discharged. The 'doughnut' is an oxidation ditch and the 'hole' is a clarifier, separated by a common wall. Rapid sand filters are used to further reduce BOD and suspended solids to the required levels. The sand filters have a top layer of coarse anthracite coal, a middle layer of common sand, and high-density garnet sand at the bottom. A chlorine contact tank provides chlorination and also serves as a reservoir for filter backwash water. Sludge is treated by aerobic digestion and land disposal. A chemical feed system is ready if phosphorus removal becomes necessary. Flocculation and tube settling mechanisms supplied with the sand filters can aid phosphorus removal. (Collins-FIRL)
W77-03440

BIOCHEMICAL MECHANISMS IN THE METHANE FERMENTATION OF GLUTAMIC AND OLEIC ACIDS,
Buck, Seifert and Jost, Englewood Cliffs, N. J. C-N. Weng, and J. S. Jeris.
Water Research, Vol. 10, No. 1, p 9-18, 1976. 5 fig, 4 tab, 9 ref, 1 append.

Descriptors: *Anaerobic digestion, *Waste water treatment, *Laboratory tests, *Methane, Radioactivity, Chemical analysis, Chemical reactions, Fermentation.
Identifiers: *Glutamic acid, *Oleic acid.

A series of 2-1 laboratory scale digesters fed on a batch basis similar to typical field operations were used to determine the biochemistry involved in anaerobic digestion processes used in waste water treatment. L(+)-glutamic acid and oleic acid were the substrates fed. Identifications were made by chemical analyses of the liquid feed and effluent and radioactivity analyses of the gases produced was by liquid scintillation techniques. It was concluded that glutamic acid was probably degraded to methane and carbon dioxide through mesaconic, pyruvic, lactic, propionic, and acetic acids. Beta-oxidation seemed to be the major mechanism in oleic acid fermentation. The major volatile acid intermediate found in methane fermentation of L(+)-glutamic and oleic acids was acetic acid. (Collins-FIRL)
W77-03441

LARGE SCALE SEWAGE TREATMENT PLANT WITH SLUDGE INCINERATOR.
Chemical Age of India, Vol. 27, No. 7, p 651-652, July, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Sewerage, *Treatment facilities, Sludge, Sludge disposal, Incineration.

The treatment process of a large industrial sewage treatment plant was described. The plant, located at the Grenzach Work of Ciba-Geigy AG, Basel, Switzerland, treats wastes from the production of dyes, textiles, auxiliaries, and industrial chemicals as well as municipal sewage from nearby communities. Major plant sections are a chemical-physical section, clarifying section, biological section, sludge and waste incinerator section. Chemical works effluent is pretreated in the chemical-physical section. The effluent has a high salt content, acidic pH, residual solvents, non-ferrous metals, and other organic substances which inhibit biological decomposition. This section contains the acidic flocculation and flotation stage, the alkaline flocculation and sedimentation stage and a buffer basin. Municipal sewage is pretreated in the mechanical clarifier parallel to the industrial effluent treatment line. A mixture of both is fed to a distributor basin. Biological treatment consists of aeration, deaeration and secondary settling. The return sludge is recirculated and the cleaned sewage is fed into the Rhine river. The sludge is dewatered and burned in a fluidized-bed furnace and the ash (6 cu m per day) containing no more than 1% organic matter is hauled to a dump. The plant also contains a refuse incinerator which burns all kinds of industrial wastes. (Collins-FIRL)
W77-03442

COMPARISON OF AIR AND OXYGEN ACTIVATED SLUDGE SYSTEMS,
Camp Dresser and McKee, Inc., Boston, Mass. A. A. Kalinske.
Journal Water Pollution Control Federation, Vol. 48, No. 11, p 2472-2485, November, 1976. 2 fig, 2 tab, 57 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Air, *Oxygen, Dissolved oxygen, Metabolism.

A study to determine the reality of claims made for oxygen activated sludge systems was conducted. It was claimed that elevated DO caused basic changes in the metabolic activity and characteristics of organisms composing an activated sludge floc; that flocculant suspension settles at a higher velocity for any given concentration of such flocculant biomass; that an elevated DO

reduces microbial cell growth or synthesis will be reduced for the removal of a given amount of organic substrate or BOD; and that an elevated DO permits a higher bio-oxidation rate and higher BOD loadings for equal BOD removals. Results indicated that for most physical and biochemical parameters, both systems were comparable. An elevated DO above 2 mg/liter had no influence. A lower mixed liquor pH may cause some inhibition of nitrification at lower temperatures in oxygen systems. Oxygen systems can supply a high oxygen input needed for high strength wastes for which air systems need increased mixing intensity. Higher DO levels possible with oxygen systems provide a short period reservoir of oxygen when uptake increases, but if this uptake lasts, DO levels will drop to zero if supply does not match demand. But this is true for all systems. With monitoring and automation, both systems can perform equally in this respect. In large plants, costs are relatively equal. There is no basis for the assumption that oxygen systems demand less power. (Collins-FIRL)

W77-03443

OXYGEN AND AIR ACTIVATED SLUDGE: ANOTHER VIEW.

Brown and Caldwell, Walnut Creek, Calif.
D. S. Parker, and M. S. Merrill.

Journal Water Pollution Control Federation, Vol. 48, No. 11, p 2511-2528, November, 1976. 13 fig, 2 tab, 46 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Oxygen, *Air, *Dissolved oxygen, Mixing, Flocculation, Aquatic microorganisms.
Identifiers: Food to microorganism ratio.

A study was conducted to compare and clarify conflicting claims made for the oxygen and air activated sludge processes. The activity of DO was studied by consideration of the effects of macromixing and micromixing on activated sludge floc size, substrate concentration, F:M ratio, and DO penetration. It was found that oxygen activated sludge required higher DO levels to maintain floc penetration of DO than air activated sludge. Oxygen systems can be designed at higher F:M levels than air systems. However, oxygen systems had a better ability to cope with unexpected increases in organic loading. The systems were proved equal in operation when a minimum DO of 2.0 mg/liter was maintained in regard to settleability. The previously mentioned minimum DO ensured an equal sludge production for most municipal waste waters. DO control in air activated systems is no more costly or difficult on an annual basis than in an oxygen activated system. The oxygen activated system has produced high performance standards which only well-designed and operated air systems can compete with. The oxygen system is best applied in situations where space limitations occur, where there is a side load fluctuation, or when strong municipal or industrial waste waters are treated. (Collins-FIRL)

W77-03444

ULTRAVIOLET DISINFECTION: AN ALTERNATIVE TO CHLORINATION.

Canada Centre for Inland Waters, Burlington (Ontario).
B. G. Oliver, and J. H. Carey.

Journal Water Pollution Control Federation, Vol. 48, No. 11, p 2619-2624, November, 1976. 2 fig, 6 tab, 16 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Ultraviolet radiation, *Disinfection, *Chlorination, Waste water (Pollution), Toxicity.
Identifiers: *Ultraviolet disinfection.

Because chlorine residues are toxic to aquatic life, UV disinfection of waste water was studied. This is done with a UV wavelength of about 254 nm. It did not become popular because chlorine was

cheaper and provided some degree of residual protection. Major problems encountered with UV disinfection were: the need to maintain residual protection from bacterial contamination during transport and the difficulty of obtaining totally sterile water from a raw water supply with variable turbidity and color. Studies have shown that 99% of total coliform, fecal coliform and fecal streptococcus could be killed with low doses, that bacterial kill was independent of light intensity, and that ultrasonic pretreatment produces a higher bacterial kill. Experiments were conducted with UV lights over secondary clarifiers in an activated sludge plant. This indicated that total coliform and fecal streptococcus are less sensitive to UV light than fecal coliform bacteria. All pathogens and viruses studied were as sensitive or more sensitive to UV light than fecal coliforms. Problems encountered were large surface areas of clarifiers which altered effluent residence time near the surface and the variable flow rate at waste water treatment plants. Flat weirs on final clarifiers are necessary before UV disinfection is practical. This method would also suppress algae growth on the weirs. Its major advantage is that it is less harmful to the environment than chlorination, though chlorine is cheaper. (Collins-FIRL)

W77-03445

FLOW EQUALIZATION BY USE OF AERATION TANK VOLUME.

Drexel Univ., Philadelphia, Pa. Dept. of Environmental Engineering.
R. E. Speece, and M. LaGrega.

Journal Water Pollution Control Federation, Vol. 48, No. 11, p 2599-2608, November, 1976. 8 fig, 8 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Biochemical oxygen demand, *Treatment facilities, Flow, *Flow control, Flow rates, Aeration.
Identifiers: Flow equalization.

Flow equalization was examined as a method for producing waste treatment effluent with a better average quality. It was expected that this process would improve overall treatment efficiencies, extend plant design life, reduce operating costs, and reduce waste water quantities by-passed. Economic advantages of the system were not clear. However, a study showed that a separate upstream equalization basin is more costly than basing design overflow rates for the clarifiers on the peak rather than average flow. There was a definite relationship between overflow and suspended solids in the effluent. A reduction in effluent was accompanied with a reduced BOD. Several methods were tried in flow equalization, such as basins to equalize raw flow before reaching treatment plant; some waste water flows were equalized to provide uniform 24-hr discharge to anaerobic contact processes; and some industries store a 24-hr waste water flow, check it for toxicity and then discharge it to a biological treatment unit. Aeration tank volume has been used for equalization purposes and oxygen transfer has also been a consideration in the process. Other considerations discussed were the probability of overflow, concentration equalization, soluble BOD removal, location of equalization systems in the flow scheme, and regulatory approval. (Collins-FIRL)

W77-03446

VIRUS AND BACTERIAL REMOVAL FROM WASTE WATER BY LAND TREATMENT.

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. G. Gilbert, C. P. Gerba, R. C. Rice, H. Bouwer, and C. Wallis.

Applied and Environmental Microbiology, Vol. 32, No. 3, p 333-338, September, 1976. 1 fig, 5 tab, 19 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Pollutant identification, *Viruses, *Sewage bacteria, Coliforms, Streptococcus, Salmonella.
Identifiers: *Virus removal, *Bacterial removal.

This study was conducted to evaluate the effective removal of viruses and bacteria from secondary sewage effluent and to evaluate their movement in soil during flooding. Results indicated that fecal coliforms, fecal streptococci, and total bacteria were decreased about 99.9% in renovated well water and Salmonella were not found in 5 liter well water samples from the east center well at two samplings. There were no detectable viruses in the well water which indicated that 99.99% of them were removed during percolation of waste water through 9 m of sandy loam soil. Sewage effluent samples contained poliovirus types 2 and 3, echovirus 7 and 15, coxsackievirus B4, and reovirus types 1 and 2, which varied with the time of year. It was proved that human bacterial and viral pathogens were mostly removed from sewage effluent when it percolates through the soil. After eight years of operation, the project showed that viruses, enteric bacterial pathogens, and pollution indicator organisms in renovated sewage effluent were very decreased or nondetectable after filtering waste water through soil recharge basins. Land treatment was shown to be a very satisfactory method of waste water renovation. Studies on the detection and assessment of the survival potential of virus populations retained in the soil should be undertaken. (Collins-FIRL)

W77-03447

AN OPERATOR'S APPROACH TO AEROBIC DIGESTER SUPERNATANT DISPOSAL PROBLEMS.

Montgomery County Sewer Authority, Oaks, Pa.
R. G. Fricker.

Water Pollution Control Federation Highlights, Vol. 13, No. 10, p D2-D3, October, 1976.

Descriptors: *Waste water treatment, *Pollutant identification, *Biochemical oxygen demand, *Treatment facilities, *Digestion, *Aerobic treatment, Waste disposal, Anaerobic digestion.
Identifiers: *Aerobic digestion.

Problems associated with aerobic and anaerobic digester supernatant and means of detecting them were discussed. Two major problems encountered with aerobic supernatant are the tremendous hydraulic loading caused by abruptly returning large amounts of supernatant to the head of the plant and the possibility of high SS levels returned to the head of the plant with the supernatant. The first problem can be determined by noticing SS concentrations at the influent and effluent end of the primary and secondary clarifiers and by noticing solids washing over the weirs during supernatant return. Scheduling the liquid return for low flow times and slowing the rate reduces the hydraulic load on the treatment units. Some form of settling aid can reduce the second problem. With anaerobic digester supernatant excessive BOD can be formed which can be monitored by keeping good BOD records for influent and effluent of each treatment unit and by DO tests to determine the freshness of the incoming load. A black septic sludge on top of primary tanks can indicate a problem. A hydraulic overload may be countered by methods similar to those used with the problem in aerobic digester processes. Turbidity and SS tests can determine high solids loading. Hydrogen sulfide content can be determined by tests or by a rotten egg odor in the plant. Problems with pH can be handled by monitoring the pH of the supernatant. The amount of suspended solids in the supernatant can be controlled by polyelectrolytes. (Collins-FIRL)

W77-03449

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

SUPERNATANT DECANTING OF AEROBICALLY DIGESTED WASTE ACTIVATED SLUDGE,

Carmel Sanitary District, Calif.

M. Paredes.

Water Pollution Federation Highlights, Vol 13, No 10, p D4-D5, October, 1976, 2 fig.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Aerobic treatment, *Digestion, Sewage treatment, Aeration, Mixing.

The Carmel Sanitary District, in 1973, began operation of a secondary activated sludge treatment process. It included two aeration tanks which were aerated and mixed by two surface aerators which ran continuously. Supernatant decanting basins in each tank helped to settle sludge and return solid materials to the digestion area. Submerged entrance ports allowed mixed sludge to enter the basins and settle on the bottom while clarified or decanted supernatant passed over outlet weirs to return to the waste water flow ahead of the secondary sedimentation tank or to the final clarifier. The sludge was returned to the main digestion area. Because of turbulence in the supernatant decanting basins a clear decanted liquid was impossible. The tanks were alternately shut down creating the problems of sludge rising to the top and going over the weirs and bad odors after start-up. A hole was cut in one side of the decanting basins which extended above and below the water line and a wooden sluice box was attached to the outside of the settling basins over the hole to allow it to slide up and down until clear liquid could be brought into the settling basin and the surface sludge kept out. This caused poor settling in the digestion area and one tank was permanently shut down to receive sludge from the other and act as a settling tank. This cleared the decanted supernatant and improved sludge settling in the main digestion area. A submersible pump was installed 60 cm below water level in the decanting basin of the settling tank to pump clear supernatant to the aeration basins and aid in the clarification of the final clarifier. Drawing off sludge regularly from the bottom of the settling tank, not running an aerator in this settling, and keeping water sprays on top of the tank produces a consistently clear supernatant. (Collins-FIRL)

W77-03450

INTERMITTENT SAND FILTRATION OF HOUSEHOLD WASTEWATER,

Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.

D. K. Sauer, W. C. Boyle, and R. J. Otis.

Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE4, p 789-803, August, 1976, 3 fig, 10 tab, 9 ref, 1 append.

Descriptors: *Waste water treatment, *Activated sludge, *Pollutant identification, *Biochemical oxygen demand, *Chemical oxygen demand, Treatment facilities, Filtration, Sands.

Intermittent sand filtration of septic tank and aerobic treatment unit effluents was investigated as an alternative to subsurface disposal for household waste water treatment. Filters at one home site treated septic tank effluent, while those at another home site treated activated sludge extended aeration effluent. Twenty-four hour composite samples were obtained from the septic tank, aerobic unit, and intermittent sand filter effluents. Combined aerobic and sand filter treatment provided a highly treated effluent in terms of BOD, COD, and TSS. The effluent quality meets suggested current surface discharge effluent standards. It operated successfully at an average hydraulic loading rate of 3.5 gal/day sq ft for 9 mo. before surface sand maintenance was required. Sand filtration of septic tank effluent at an average hydraulic loading rate of 5 gal/day/sq ft produced complete nitrification and BOD and TSS that meet surface discharge effluent standards. Successful maintenance for

sand filters used with a septic tank included removing the top 2 to 5 in. of clogged sand and replacing it with clean sand and raking it without adding clean sand. Total annual costs for treating and disposing of household waste water using intermittent sand filter systems ranged from \$400 to \$700, depending on the use of septic tanks or aerobic treatment units and the size and method of maintenance of the sand filters. (Snyder-FIRL)

W77-03452

TERTIARY TREATMENT OF SEWAGE EFFLUENTS,

Mander, Raikes and Marshall, Bristol (England).

M. A. Kershaw.

Process Biochemistry, p 21-23, 25, September 1976, 10 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Treatment facilities, *Tertiary treatment, Sewage effluents, Biochemical oxygen demand, Suspended solids.

A review is presented of tertiary treatments, or polishing processes, applied to sewage effluents to make them comply with standards more stringent than 30 ss (suspended solids): 20 BOD. In upward flow filters, the larger solids are trapped in the bottom, coarse medium and the finer solids in the top, fine medium. Their performance depends on the flow rate; with filter effluent loading of 100 cu m/sq m/day 90% solids removal can be achieved. With Micro strainers, results vary with the quality of fabric on the drum, and the key to successful performance is the quality of the influent. Rapid gravity sand filters are successful as treatments for percolating filter and activated sludge effluents. Normal loading is between 200 and 250 cu m/sq m/day. Slow sand filters are found at older, smaller sewage works; they produce higher costs than other methods of effluent polishing. With the upward flow carrier, the effluent is passed up through a bed of pea gravel and the suspended solids are removed from the influent by flocculation and settlement. The action of lagoons or maturation ponds consists of a combination of buffering sedimentation and biological activity. For a retention period of 4 days 40% ss and BOD reduction and 70% E. coli reduction are often achieved. In the operation of grass plots, the first consideration is to ensure that the feed liquor is evenly distributed and does not pond or short circuit. This form of treatment is well suited to small sewage works in rural areas where land is available. (Miller-FIRL)

W77-03453

MINIMIZING THE WASTE DISCHARGES FROM WATER TREATMENT PLANTS,

Connecticut Univ., Storrs. Dept. of Civil Engineering.

T. B. Helfgott, and W. J. Lacy.

American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 151, p 166-169, 1975, 2 fig, 2 tab, 6 ref.

Descriptors: *Sludge treatment, *Dewatering, *Energy equation, *Solid wastes, *Waste water treatment, Electric power, Mathematical models, Waste treatment, Analytical techniques. Identifiers: Power indices.

A solids power index for making normalized comparisons between various dewatering techniques is proposed. The power index expresses the energy utilization of a dewatering technique in kilowatt-hours/1000 lb dry solids. The parameter is limited in that it does not account for the specific chemical nature of the solids being dewatered nor dewatering characteristics as a parameter for filterability. Graphical comparisons involving the solids power index as a function of % solids are illustrated for dewatering via evaporation, vacuum filtration, double cell gravity concentrations, and screw press multi-roll sludge dewatering. (Kreager-FIRL)

W77-03455

GROUNDWATER QUALITY ADJACENT TO A SEPTIC TANK SYSTEM,

ADI, Ltd., Fredericton (New Brunswick).

T. Viraraghavan, and R. G. Warnock.

American Water Works Association Journal, Vol. 68, No. 11, p 611-614, November, 1976, 8 fig, 2 tab, 9 ref.

Descriptors: *Groundwater, *Water quality, *Septic tanks, Water analysis, Tanks, Nitrogen, Pollutant identification, Soil water, Waste water treatment, Snow, Public health, Lysimeters, Soil analysis.

An investigation was performed to determine the adequacy of a septic tile system as a treatment to reduce constituents of septic tank effluent. Adjacent groundwater was analyzed to determine its chemical and bacteriological quality. The study site was near Ottawa, Canada. Low winter temperatures with snow cover and snow melting in the spring with high groundwater levels were the most significant climatic conditions affecting the study. A collecting tank was installed into which some of the septic tank effluent from the household system was diverted. In addition, an observation trench was constructed to install the lysimeters and collect soil water samples collected through the lysimeters. Groundwater from the observation trench was sampled and analyzed. Test site soil was evaluated as to its percolation rate and coefficient of permeability. Environmental factors considered were temperature, unsaturated depth of soil (depth of groundwater), and snow cover. Results showed that soil removed a high percentage of TSS, BOD, SOC, ammonia nitrogen, iron, coliforms, fecal coliforms and fecal streptococci from septic tank effluent. High ammonia reduction corresponded with increases in nitrate levels in adjoining groundwater, a possible health hazard. Groundwater levels affect soil limits for pollutant absorption. Pollutant concentrations in groundwater as well as nitrate nitrogen were higher near the tile and significantly decreased farther away from the tile end. Winter operation was not especially problematic, as the snow cover and hot water discharge from the system kept nearby ground warm. (Collins-FIRL)

W77-03456

CYANOPHAGE ANALYSIS AS A BIOLOGICAL POLLUTION INDICATOR-BACTERIAL AND VIRAL,

North Carolina Univ. at Greensboro. Dept. of Biology.

For primary bibliographic entry see Field 5A.

W77-03460

A STUDY OF MIXING CHARACTERISTICS OF SEWAGE STABILIZATION PONDS WITH RADIOACTIVE TRACERS,

Birmingham Univ., (England), Dept. of Civil Engineering.

K. O. Iwugo, and R. Winnicki.

The Public Health Engineer, Vol. 4, No. 5, p 138-142, September, 1976, 5 fig, 4 tab, 15 ref.

Descriptors: Analytical techniques, *Domestic wastes, *Sewage treatment, *Stabilization, *Tracers, Ponds, Mathematical studies, Fluid mechanics, Retention, Radioactivity, Measurement, Evaluation, Performance, *Mixing.

The actual retention times of domestic waste waters in two sewage stabilization ponds were determined using the fundamental fluid mechanics concept of residence time distribution and radioactive tracers. The dispersion index of mixing in each of the ponds was also deduced to quantify the degree of mixing in each of the ponds. Both tritium and chromium-ethylenediaminetetraacetic acid complex were found suitable for the determination of the residence time distribution. Tritium is more economical but has a half-life of 12-15 yr as compared with a half-life of 28 days for the chromium-ethylenediaminetetraacetic acid complex, making

the latter tracer more attractive from an environmental standpoint. (Kreager-FIRL)
W77-03461

USE OF INTRINSICALLY SAFE INSTRUMENTATION.

For primary bibliographic entry see Field 5A.
W77-03462

LABORATORY STUDIES ON THE EFFECTS OF TEMPERATURE ON ACCUMULATION OF SOLIDS IN BIOLOGICAL FILTERS.

Aston Univ., Birmingham (England). Dept. of Biological Sciences.
M. R. N. Shephard, and H. A. Hawkes.
Water Pollution Control, Vol. 75, No. 1, p 58-72, 1976. 12 fig, 1 tab, 18 ref.

Descriptors: *Sewage treatment, *Laboratory tests, *Temperature, *Filters, Biochemical oxygen demand, Microorganisms, Oxidation, Organic compounds, *Waste water treatment, Filtration.
Identifiers: *Biological filters.

Laboratory scale filters under controlled temperature conditions with and without macrograzers were used to investigate seasonal variations in the film accumulation in biological filters. The BOD of feed and effluent, the wet weight of the film, and the CO₂ output for each filter were determined weekly. Results indicated that without macrograzers, solids accumulation was controllable at higher temperatures by microbiological activity. Contributing factors for this seemed to be alternating periods of build-up and sloughing caused by an increase in the microorganisms which are the attachment layer on the substratum die, grazing by microfauna, and the differential effect of temperature on the rates of BOD removal and oxidation of the removal BOD. There was a reduction in the oxidation rate as measured by CO₂ output at temperatures less than 20°C, though similar temperature reductions did not have a great effect on the BOD removal rate. The increased accumulated solids in the filter were partially responsible for reduced BOD removal efficiency at low temperatures. At 20°C, the amount of solids was controlled at a more uniform and lower level by grazing than by microbiological means. It seems that some applied organic matter is immediately oxidized by microorganisms while some may be stored and oxidized later. (Collins-FIRL)
W77-03464

ULTRAVIOLET PURIFICATION SYSTEM.

For primary bibliographic entry see Field 5A.
W77-03467

NITRATE MONITORING.

For primary bibliographic entry see Field 5A.
W77-03468

AUTOMATION: A SHORT HISTORY, BUT A LONG FUTURE.

Greeley and Hansen, Philadelphia, Pa.
C. M. Norkis, and H. D. Gilman.
Water and Wastes Engineering, Vol. 13, No. 7, p 97-98, 100, July, 1976. 1 fig.

Descriptors: *Automation, *Waste water treatment, *Automatic control, *Computer models, *Design, Monitoring, Mathematical models, Instrumentation, Treatment facilities.
Identifiers: Computer hardware, Computer software.

Automation is rapidly entering the field of waste water treatment as the costs of computer hardware declines and more relevant computer systems are designed. The needs of waste water management include development of reliable sensors, performance specifications for new and existing hardware, research and development of control strate-

gies, development of designers' guides, and study of interactions of unit processes. More computerized monitoring and control units are being installed and contribute to both centralized and distributed control systems. The U. S. Environmental Protection Agency has supported automation efforts, including the role of universities, development of digital technology to reduce costs, and mathematical modeling for waste water treatment. Instrumentation and automation in the Philadelphia area is described. Specific hardware and software is also detailed. (Collins-FIRL)
W77-03469

THE LIMITATION OF THE RATIO OF FECAL COLIFORMS TO TOTAL COLIPHAGE AS A WATER POLLUTION INDEX.

Department of Agriculture, Lethbridge (Alberta).
For primary bibliographic entry see Field 5A.
W77-03472

EFFECT OF VARIABLE LOADING ON OXYGEN UPTAKE.

Iowa State Univ., Ames, Dept. of Civil Engineering.
J. B. Duggan, and J. L. Cleasby.

Journal Water Pollution Control Federation, Vol. 48, No. 3, p 540-550, March, 1976. 6 fig, 2 tab, 14 ref.

Descriptors: *Activated sludge, *Pilot plants, *Settling basins, *Dissolved oxygen, *Oxygen demand, Mixing, Aeration, *Waste water treatment, Pollutant identification.
Identifiers: *Oxygen uptake, *Package plants, Waste loading.

A study was conducted to determine oxygen uptake responses to influent waste loading in an activated sludge system. The study employed a package pilot plant consisting of an aeration basin and a hopper-bottom final settling basin. There were six 24 hr test runs made during the late summer and early fall. Results indicated a direct response of mixed liquor DO to influent substrate load variations when DO levels are greater than the DO concentration critical to microbial oxygen utilization. DO deficit changes were a dependable measure of oxygen transfer rate changes in the mixed liquor and an indirect measure of variations of mixed liquor oxygen demand. Measurement of mixed liquor oxygen uptake rates also proved a good indicator of microbial oxygen uptake response to influent substrate load variations. There was evidence that mixed liquor DO levels below those critical to microbial oxygen utilization contributed to lower substrate removal efficiencies in the system. It was suggested that the magnitude of endogenous respiration and the temporary substrate storage as results of aeration detention time caused a dampening of mixed liquor oxygen uptake response relative to corresponding variations in the influent substrate loading. Maintenance of mixed liquor DO above critical levels is necessary to achieve high substrate removal efficiencies. (Collins-FIRL)
W77-03473

RAPID DETECTION OF BACTERIAL ENDOTOXINS IN DRINKING WATER AND RENOVATED WASTE WATER.

Texas Univ. Health Science Center at San Antonio. Dept. of Pathology.
For primary bibliographic entry see Field 5A.
W77-03474

INVESTIGATION OF OXYGEN TRANSFER TO SLIME AS A SURFACE REACTION.

Toledo Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W77-03476

TRANSFERABLE DRUG RESISTANCE ASSOCIATED WITH COLIFORMS ISOLATED FROM HOSPITAL AND DOMESTIC SEWAGE.

Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5A.
W77-03478

INFILTRATION/INFLOW - THE KANSAS CONNECTION.

Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W77-03479

A STUDY OF SUBSTRATE REMOVAL IN A MICROBIAL FILM REACTOR.

Cape Town Univ. (South Africa). Dept. of Chemical Engineering.
N. P. Harris, and G. S. Hansford.
Water Research, Vol. 10, No. 11, p 935-943, 1976. 12 fig, 1 tab, 43 ref.

Descriptors: *Mathematical models, *Chemical oxygen demand, *Microorganisms, *Slime, Model studies, *Organic loading, Carbon, Oxygen, Kinetics, *Waste water treatment.
Identifiers: *Biofilm reactors, Hydraulic loading.

A mathematical model was proposed to predict the quantity of substrate removable by slime when it is subjected to various hydraulic and organic loadings. It was, also, to determine if performance of the slime was limited by either a lack of organic carbon or oxygen, or both. Supportive data was obtained by measuring substrate removals on a vertical experimental biofilm reactor over a range of hydraulic and organic loadings similar to an industrial type operation. The model is based on basic chemical engineering principles of interfacial mass transfer, diffusion, and biochemical reaction and, using kinetic parameters which fell within variations reported in literature, predicted the reactor's COD removal capacity when subjected to organic and hydraulic loadings. It also showed whether the operation of the film was limited by substrate, oxygen, or both together. It indicated that change from one to the other occurred between organic loadings of 300 to 500 mg/liter COD. There was poor correlation between model predictions and experimental results pertaining to hydraulic loadings approaching minimum wetting rate. The model becomes unreliable in predicting results of conditions of low hydraulic load. (Collins-FIRL)
W77-03480

INNOVATION IS AN OLD IDEA--WITH A BIG FUTURE.

Camp, Dresser and McKee, Boston, Mass.
R. H. Culver, A. A. Kalinske, and R. L. Woodward.
Water and Wastes Engineering, Vol. 13, No. 7, p 43-48, 112, July, 1976. 1 tab.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewage disposal, *Water treatment, Reviews, Computers, Recycling, Design, Potable water, Energy, *Water reuse.

An historical perspective of developments in treating water and sewage was used to project the types of future developments in the field. Advances in this area have traditionally been evolutionary rather than radically advanced by leaps and bounds. Most techniques presently used were developed during the past fifty years and the processes and materials involved refined with the passage of time. Systems are being designed and developed which will have a probable lifetime of fifty to seventy-five years. There is no expectation of radical advances and the water treatment and sewage disposal systems of the next one hundred years will be quite recognizable. Considerations such as cost effective systems and energy efficiency, as well as resource recovery and recycling of

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

clarified water for uses other than drinking water. Computerization will also become a more important part of systems design in the future. (Collins-FIRL)
W77-03482

GRANT AID FOR PLANT OPERATIONS: AN EVALUATION.
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 5G.
W77-03483

AEROSOL PRODUCTION BY IRRIGATION EQUIPMENT USED FOR LAND APPLICATION OF WASTE WATER.
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 5A.
W77-03484

RISK OF COMMUNICABLE DISEASE INFECTION ASSOCIATED WITH WASTE WATER IRRIGATION IN AGRICULTURAL SETTLEMENTS.
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5C.
W77-03485

REMOVAL OF BOD AND NITROGENOUS POLLUTANTS FROM WASTEWATERS.
Air Products and Chemicals, Allentown, Pa. (Assignee).
J. P. Casey, and M. L. Spector.
United States Patent 3,994,802. Issued November 30, 1976. Official Gazette of the United States Patent Office, Vol. 952, No. 5, p 2160, November, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Aerobic conditions, *Anaerobic conditions, *Nitrogen, *Biochemical oxygen demand, *Mixing, *Activated sludge, Nitrification, Denitrification, Dissolved oxygen.

A process for purifying waste water with activated sludge has been patented. Waste water is subjected to continuous flow through several successive zones of an activated sludge system, where BOD is reduced and nitrogenous pollutants are removed. The influent waste water is mixed with activated sludge, nitrified and denitrified, and mixed with free oxygen-containing gas under aerobic conditions. This provides a mixed liquor which is passed, without separation, to further treatment under anaerobic conditions in the presence of nitrates or nitrites plus microorganisms. The liquor is then again treated with an oxygen-containing gas and is introduced into a final settling zone to separate the settled solids from the supernatant liquid. Part of the settled solids are returned as activated sludge; a portion of the microorganisms which have been oxidized are returned; and the mixed liquor is maintained with a dissolved oxygen level of one ppm and a F/M ratio of 1.5. (Kramer-FIRL)
W77-03486

SEWAGE SLUDGE TREATMENT SYSTEM.
California Inst. of Tech., Pasadena, Calif. (Assignee).
J. J. Kalvinskas, S. Pasadena, and W. A. Mueller.
United States Patent 3,994,804. Issued November 30, 1976. Official Gazette of the United States Patent Office, Vol. 952, No. 5, p 2160-2161, November, 1976. 1 fig.

Descriptors: *Incineration, *Sewage treatment, *Liquid wastes, *Activated carbon, *Recycling, *Mixing, *Sludge treatment, *Sludge disposal, *Settling basins, *Sedimentation, *Effluents, *Sewage sludge, *Patents.
Identifiers: *Pyrolysis.

A patented method for treating raw liquid sewage is described. The process, used when the waste includes water with dissolved organic and inorganic matter as well as suspended matter, involves mixing the raw liquid waste with activated carbon and ash, then introducing the mixture into a primary settling tank for settling the suspended matter as primary sludge. The effluent from this first tank is mixed, then fed to a secondary settling tank to permit the settlement of secondary sludge. Both the primary and secondary sludges are dewatered and sent to pyrolysis equipment. There, they are formed into activated carbon and ash, mixed with raw liquid waste and effluent. In this particular invention, the primary and secondary sludges are pyrolyzed separately to form separate quantities of activated carbon and ash. The products of pyrolysis of the primary sludge are mixed with the raw waste while the products of the pyrolysis of the secondary sludge are mixed with the effluent from the first settling tank. (Kramer-FIRL)
W77-03487

COMPARATIVE ASSESSMENT OF THE EFFECTIVENESS OF CERTAIN METHODS MAKING INDUSTRIAL EFFLUENTS NONCARCINOGENIC, (IN RUSSIAN).
Gorkovskii Meditsinskii Institut (USSR).
P. E. Shkodich, M. P. Gracheva, Y. P. Tikhomirov, and V. V. Baikovskii.
Gig Sanit 1, p 13-15, 1975.

Descriptors: Industrial wastes, *Waste water treatment, Effluents, Organic wastes, *Biological treatment.
Identifiers: *Ozonation, *Chemical treatment, *Mechanical treatment(Wastes).

The effectiveness of treatment of the effluents from 16 organic synthesis plants in rendering them non-carcinogenic was studied. Of mechanical, biological and chemical decontamination methods, ozonation was the most effective and reliable. Copyright 1976, Biological Abstracts, Inc.
W77-03488

FLUIDIZED WASTE INCINERATOR AND METHOD.
Shell Oil Co., Houston, Tex. (Assignee).
W. R. Pledger, and J. E. Gwyn.
United States Patent 3,994,244. Issued November 30, 1976. Official Gazette of the United States Patent Office, Vol. 952, No. 5, p 2175, November, 1976. 1 fig.

Descriptors: *Incineration, *Sewage treatment, *Sewage sludge, *Sludge disposal, *Patents, *Equipment, Waste water treatment, Joints(Connections).
Identifiers: Combustion, Conduits, Fluidized beds.

A patent has been granted for a fluidized bed incinerator for sewage sludge and similar waste liquids containing a high proportion of easily fusible salts. The equipment includes: a refractory lined vessel; means for holding dense fluidized solids in a bed in the lower part of the vessel, with a bed supporting grate and means to force air upward through the bed; equipment to introduce a stream of feed into the fluidized bed; and effluent take-off means to communicate with the upper portion of the vessel and withdraw an effluent stream of combustion vapors and entrained solids. These take-off means have the properties of comprising a refractory-lined metal conduit which connects one end of the vessel with the other; a second conduit, communicating with the first, at about right angles; and quench water injection means adapted to spray quench water directly into the opening of the second conduit. (Kramer-FIRL)
W77-03489

VARIATIONS OF COLIFORM BACTERIA AND OTHER POLLUTION INDICES IN SURFACE WATERS.
Public Health Service, Washington, D.C. Water Quality Section.
For primary bibliographic entry see Field 5B.
W77-03539

FERMENTATION OF WASTE MATERIALS TO PRODUCE INDUSTRIAL INTERMEDIATES.
Oak Ridge National Lab., Tenn.
A. L. Compere, and W. L. Griffith.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-750823-3. Price codes: A02 in paper copy, A01 in microfiche. CONF 750823-3, (1975). 16 p, 1 fig, 4 tab, 8 ref.

Descriptors: *Recycling, *Waste treatment, *Fermentation, Acids, Organic matter, Alcohols, Technology.
Identifiers: *Lactic acid, Volatile acids, Whey.

The utilization of organic wastes by fermentation to produce commercially valuable acetic acid, acetone, n-butyl alcohol, ethyl alcohol, formic acid, lactic acid salts and propionic acid is proposed. Production of lactic acid for use in dairy products or for production of acrylic acid and other industrial compounds from waste sour whey is illustrated by a bench-scale system, seeded by a kefir-delivered culture, and using a fixed-film bioreactor (ANFLOW unit), and an ion exchange column. The whey lactic acid concentration was increased to 2.1% from 1.4% after a single passage through the ANFLOW unit and the six-foot column, then stripped of its lactic acid by a macroporous weak anion exchange resin. If acids, rather than salts, are desired as resin products, they can be stripped with a strong acid, such as sulfuric acid, and regenerated with a base in a separate step. The lactic acid recovery equalled 62%. Recovery of a more concentrated lactic acid solution is possible. Many industrial wastes could serve as fermentation feeds and although byproduct recovery may be marginal it can be profitable when it is coupled with the consequent decreased sewer charges due to decreased organic contents and SS of wastewaters. The system is comparable to a conventional industrial sewage treatment or water-softening unit. (Auen-Wisconsin)
W77-03563

THE COST OF PRODUCING EFFLUENTS TO VARYING STANDARDS BY BIOLOGICAL TREATMENT TECHNIQUES.
J. M. Sidwick, and J. R. Preston.
Effluent and Water Treatment Journal, Vol. 16, No. 5, p 238-241, 244-247, May, 1976. 8 fig, 5 ref.

Descriptors: *Capital costs, *Waste water treatment, *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, Effluents, Standards, Mathematical studies, Cost analysis.

The capital costs of achieving various standards of effluent by biological methods are discussed. Various mathematical fits were examined with the assistance of a computer. Recorded and reported costs on civil engineering schemes are rarely on the same basis: unit costs may or may not include ancillaries. Principal biological treatment methods are subdivided into biological filtration and activated sludge treatment. Thirty mg/liter suspended solids and 20 mg/liter biochemical oxygen demand (BOD) in 5 days was taken as the norm for full treatment. The cost per head decreases as population increases for inlet works. Rectangular, pyramidal, and circular primary sedimentation tanks did not differ significantly with regard to costs. Since the principal cost of a biological filter is in the medium, the curve for cost per cu m follows a predictable slope showing reducing unit cost with increasing volume. Insuffi-

cient data were available upon which to base meaningful cost curves for high-rate biological filters using conventional medium, but conventional media installations are less expensive in terms of capital cost than their synthetic medium counterparts. High rate activated sludge treatment is less expensive than standard rate activated sludge treatment for all population sizes. Cost decreases as volume and population increase. Site costs vary from 25% of the aggregated unit costs for the smaller works to 10% for the larger works. Aeration package plants are cheaper than package plants using biological-disc methods of treatment. In general, cost per population equivalent decreases as unit size increases. (Snyder-FIRL) W77-03568

RECENT DEVELOPMENTS IN THE USE OF POLYELECTROLYTES,

D. B. Moll.

Water and Waste Treatment, Vol. 19, No. 9, p 39, September, 1976. 2 tab.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Polyelectrolytes, *Separation techniques, Solid wastes, Liquids, Dewatering.

Synthetic polyelectrolytes have received much attention in Britain for use in the solid-liquid separation process of sewage treatment. They are generally reliable in achieving a high degree of solids recovery and have been used in mechanical dewatering and vacuum filtration. 'In-line' dosing of sludge has proved suitable for most sludge pumps and eliminates the need for chemical preparation and dilution tanks, thus offering considerable cost savings. Polyelectrolytes have successfully replaced traditional conditioners such as the lime-copper s combination and aluminum chlorohydrate. Their use has proven advantages which include: elimination of scaling problems, increased press capacity, reduced chemical handling problems, elimination of inorganic conditioner-induced corrosion, reduction of chemical storage space needs, and a non-contribution to ash loading when incineration is considered. It is concluded that further investigation will reveal other productive uses for synthetic polyelectrolytes. (Collins-FIRL) W77-03569

SODIUM BICARBONATE NEUTRALIZES,

N. Barber.

The American City and County, Vol. 91, No. 11, p 54-55, November, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Sewerage, *Treatment facilities, Sodium compounds, Bicarbonates, Neutralization.

Identifiers: Sodium bicarbonate.

Large amounts of waste paper fibers collecting in the primary settling basin of the West Nyack, N. Y. sewage treatment plant caused a serious digester souring problem. The system's pH had fallen from 7 to 4.8. Raw sewage was pumped into the primary digester, but the anaerobic microorganisms were adversely affected and recovery was doubtful. About 700 lb/day of sodium bicarbonate was added and the pH began to rise, ranging from 6.9 to 7.1. Alkalinity rose from less than 2000 mg/liter to 4000 mg/liter. Waste digestion improved greatly. When reasonable pH and alkalinity levels were reached, about 150 lb/day of sodium bicarbonate were applied as a preventative. The gradual addition of sodium bicarbonate was also used to clear emulsion blockage of the settling tanks. Sodium bicarbonate functions as a buffer in the maintenance of desired acidity-alkalinity ratios for microbial activity. Sodium bicarbonate also plays a role in pH control and is an ideal medium for increasing methane production in anaerobic systems and precipitating toxic metals. (Collins-FIRL) W77-03570

EFFECT OF HIGH DISSOLVED OXYGEN CONCENTRATION IN ACTIVATED SLUDGE SYSTEMS,

T. D. Chapman, L. C. Matsch, and E. H. Zander. Journal Water Pollution Control Federation, Vol. 48, No. 11, p 2486-2510, November, 1976. 7 fig, 7 tab, 69 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Biochemical oxygen demand, *Dissolved oxygen, *Oxygen, Basins, Biological treatment, Biomass.

An evaluation of the UNOX oxygen activated sludge system was given to prove its advantages. The system is designed to use high purity oxygen for the dissolved oxygen (DO) requirements, to use a covered basin for contact between biomass, oxygen, and waste water, to operate in the same average range of power densities as air systems but at lower ones near the end of the train to develop a well flocculated biomass, to handle a broad range of F:M loadings, and to operate at a DO level range of 2 to 6 mg/liter. Aspects discussed are the effect of DO in activated sludge, organic loading and effluent quality, settleability of OE solids and MLSS levels, sludge production, nitrification, and process stability. Oxygen systems have no advantage relative to settleability, operation at higher organic loadings, or waste sludge production. But at DO levels of 4 to 6 mg/liter (oxygen system) and 1 to 2 mg/liter (air system) the following observations were made. Higher DO level oxygen systems can operate at biomass loadings (F:M) of more than twice that of air systems with the same BOD₅ and SS quality effluent. Settleability of oxygen system sludge is greater, allowing higher solids loading on the clarifier with higher recycle solids and MLSS concentrations. There is also improved dewatering of oxygen activated sludge. Less sludge is produced with the oxygen system at equivalent apparent F:M ratios. It was concluded that these characteristics were due to the increased viability of the oxygen system mixed liquor resulting from increased oxygen penetration into the floc matrix. (Collins-FIRL) W77-03571

SLUDGE DRYING BEDS ARE PRACTICAL: PART 2,

J. A. Beardsley.

Water and Sewage Works, Vol. 123, No. 8, p 42-44, August, 1976. 4 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Sewage sludge, *Drying, Chemicals, Efficiencies, Sludge treatment.

Identifiers: *Drying beds.

Chemical conditioning is important to the efficient operation of sludge drying beds. Using polymer flocculants to treat sludge prior to bed drying offers several benefits, including increased production from existing beds, heavier loadings without blinding, reduced odor because of rapid drainage, application of variable sludges and supernate, less sludge hauling because of drier cake, and easier unloading because sludge does not form small fractured crumble. Cationic polymer flocculants are most appropriate for sewage sludges. The polymer flocculant will release large quantities of free water while forming a large well-defined floc. The flocculant ties up fine supernate solids and removes the greatest volume of liquid from the digester for a given amount of solids, prevents upsets in the primary due to recycling anaerobic colloidal solids, and provides for longer stabilization time of the remaining solids. Solution flocculants allow simpler feed systems than dry polymers, but both require dispersing and metering equipment. Chemical application has made it possible for a plant using a trickling filter and mixed sludge to switch from anaerobic to aerobic digestion without adding more sand beds. In one experiment, much more water was drained from a treated sludge bed

than from a similar untreated bed. Chemical addition dramatically improved dewatering at a plant where an alum-anionic flocculant program resulted in additional solids to dewater. (See also W76-00039)(Snyder-FIRL) W77-03572

INHIBITING NITRIFICATION IN WASTE-WATER TREATMENT PLANTS,

E. L. Stover, A. Esfandi, H. Little, and D. F. Kincannon.

Water and Sewage Works, Vol. 123, No. 8, p 56-59, August, 1976. 5 fig, 11 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Chemical oxygen demand, Treatment facilities, Pollutant identification, Nitrification.

Apparent inhibition of nitrification was studied in continuous flow and batch studies using an experimental bench-scale activated sludge unit. Many compounds inhibit nitrification by interference with the general metabolism of the cell or with the primary oxidative reactions. When the influent chemical oxygen demand (COD) to an activated sludge plant increased and a sharp increase in biological solids occurred, the nitrification efficiency of the system decreased. Glucose concentrations under 750 mg/liter COD did not change nitrification rates in batch reactors containing nitrifying microorganisms, but concentrations of 777 mg/liter and 1139 mg/liter inhibited nitrification rates in the same type systems. In completely mixed one-stage activated sludge treatment plants, substrate concentrations of this magnitude would seldom occur, and the organic substrate by itself would not inhibit the biological nitrification process in such systems. A reasonable explanation would be the production by the heterotrophic microorganisms at fast growth rates of intermediary metabolic byproducts which inhibit biological nitrification. This is supported by data from other nitrification investigations. As the influent COD or biochemical oxygen demand (BOD) concentrations to a system increase, the rate of carbonaceous microorganism growth increases and depresses the nitrification rate of the system. (Snyder-FIRL) W77-03573

EXPERIMENTS ON WASTEWATER SEDIMENTATION,

University of Manchester Inst. of Science and Technology (England).

J. B. White, and M. R. Allos.

Journal Water Pollution Control Federation, Vol. 48, No. 7, p 1741-1752, July, 1976. 8 fig, 2 tab, 2 ref, append.

Descriptors: *Flow rates, *Sedimentation rates, *Tanks, *Waste water treatment, Suspended solids, Settling, Effluents, Clarification.

Identifiers: *Circular center-feed sedimentation tanks.

Tests were conducted to examine the performance of circular center-feed sedimentation tanks in the primary stage of waste water treatment. Major variables involved were the rate of flow through the tank, the concentration of suspended solids in the feed, and the settling characteristics of the suspension. Various tests were made on a full-sized tank with no control of these variables and in a small tank with means of controlling them. Settling column tests were also run on samples of the waste water used. Settling column tests on raw waste water had results which differed from those of discrete suspensions. Suspended solids concentrations decreased with time, and the rate of decrease lessened with time. Concentrations increased little with depth. Initial suspended solids concentrations greatly affected the degree of clarification in a given time. There was evidence of highly variable settling characteristics in waste

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

water. The relationship of effluent and influent concentrations and detention time in the tank tests and column tests were such that the column tests results gave an approximation of performance in the tanks. It was shown that, after two hours, only little further clarification can be expected. Other tests with reconstituted waste water indicated that the limit of concentration may decrease with decreasing surface loading. (Collins-FIRL)
W77-03574

AERATION AND OXYGEN TRANSFER IN BIOLOGICAL REACTORS.
Vanderbilt Univ., Nashville, Tenn.
W. W. Eckenfelder, Jr.
La Tribune du Cebedau, No. 389, p 160-167, April, 1976. 5 fig, 1 tab, 14 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Aerobic treatment, *Aeration, Aerobic conditions, Oxygen, Transfer, Equipment.
Identifiers: *Oxygen transfer, *Biological reactors.

The supply of oxygen to an aerobic biological treatment system is a critical aspect of proper design and operation. Oxygen, which is sparingly soluble in water, is transferred from the gas phase to the liquid phase by diffusion and convection to a concentration in accordance with Henry's Law. Under turbulent flow conditions assuming that the resistance of the liquid film controls oxygen transfer rate, transfer of oxygen from the gas to the liquid phase is a function of the overall transfer coefficient and the oxygen deficit. When oxygen is supplied to fluidized systems treating waste water via aerobic biological oxidation, a correction factor must be defined which relates the oxygen transfer to the nature of the waste. Aeration equipment is categorized into three systems: diffused aeration, turbine aeration, and mechanical aeration. All three are discussed. Diffused aeration systems include bubbler aeration and static aeration. Air is discharged from a pipe or sparge ring beneath the rotating blades of an impeller in turbine aeration. (Snyder-FIRL)
W77-03575

FLOTATION FOR WATER AND WASTE-WATER TREATMENT.
J. Pullin.
Surveyor, Vol. 4383, No. 147, p 39-40, June 11, 1976. 2 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Flotation, *Water treatment, Waste water(Pollution), Bubbles.
Identifiers: *Microflotation.

Microflotation is based on the idea that, for effective flotation, the bubbles which take the solids or oil particles to the surface should be numerous but small in size. After chemical treatment and aeration, the effluent flows down a 10 m deep divided shaft, which keeps the downward flowing effluent away from the effluent which rises into the flotation tank. Air is injected at the bottom of the shaft. Floc agglomeration begins when the effluent, free from undissolved air, begins to rise up the shaft toward the flotation tank, and gas bubbles form as the gas content of the effluent exceeds the saturation level. A dissolved air flotation plant has been in continuous operation at a sewage treatment works for 3 years with few operational problems. The plant produced a consistently good sludge float averaging 4% dry solids, good effluent and solids removal efficiencies of over 99.7%. After a series of trials using different polyelectrolytes, Zetag 94 was used as a flotation aid. It might be possible to use flotation units to elutriate and thicken digested sludge prior to mechanical dewatering, instead of using elutriation tanks. Operational experience in potable water treatment is also discussed. Practical examples are included. (Snyder-FIRL)

W77-03576

WASTEWATER'S FUTURE IS CLOUDY.
W. J. Storck.
Water and Wastes Engineering, Vol. 13, No. 7, p 20-22, July, 1976.

Descriptors: *Waste water treatment, *Sludge disposal, *Water reuse, Recycling, Potable water, Landfill, Incineration, Cost analysis, Treatment facilities.

A great deal of concern has been expressed for the future development of waste water treatment systems. The major problem is that research will probably be lessened in order to rush practical development. The primary concern is for finding means of reusing treated waste water instead of merely disposing of it. One projection involves the direct reuse of waste water as potable water. This depends upon public acceptance of the idea as well as the introduction of systems which can provide water of the required quality. Sludge also receives attention as a product of waste water treatment. It is suggested that its use as landfill or fertilizer may be extremely viable alternatives. Pyrolysis and the use of sludge-derived methane gas are also considered. Any system or method must be cost effective. (Collins-FIRL)
W77-03577

KEEP COOL WITH SEWAGE EFFLUENT - A TWO-WAY SAVING OF WATER.
For primary bibliographic entry see Field 3E.
W77-03578

OXYGEN TRANSFER IN A 23-METER BUBBLE COLUMN.
Idaho Univ., Moscow.
M. L. Jackson, D. R. James, and B. P. Leber, Jr.
American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 151, p 159-165, 1975. 4 fig, 2 tab, 5 ref.

Descriptors: *Aeration, *Waste water treatment, *Oxygen, Transfer, *Efficiencies, Waste treatment, Performance, Evaluation, Pulp and paper industry, Industrial wastes, Bubbles.

Oxygen transfer efficiencies in an aeration column (7.6 cm in diameter) were observed for liquid depths up to 21 m. Although higher air rates and liquid depths increased the oxygen transfer rate and overall efficiency, the transfer area was reduced with increasing liquid level because of the higher pressures on the entering bubbles. A diffuser provided 96% oxygen transfer at 8 m, and a pipe inlet provided 63% transfer at a liquid depth of 21 m. The performance of the narrow column may also be used to judge applications to large diameter aeration tanks with multiple inlets. The design of a plant for the treatment of 15,000 cu m/day of waste from a sulfite paper mill based on the results observed for the narrow column was analyzed in terms of treating the same waste in a lagoon; the results were favorable for tall tank aeration. (Kreager-FIRL)
W77-03579

AN ECONOMIC EVALUATION OF DEEP TANK AERATION FOR WASTEWATER TREATMENT.
Idaho Univ., Moscow.
L. L. Edwards, B. P. Leber, Jr., and M. L. Jackson.
American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 151, p 154-157, 1975. 4 tab, 13 ref.

Descriptors: *Aeration, *Cost analysis, *Waste water treatment, *Stabilization, *Oxygenation, Transfer, Oxygen, Economics, Model studies, Pulp and paper industry, Industrial wastes, Liquid wastes, Waste treatment.
Identifiers: Deep tank aeration.

An economic comparison between a deep-tank aeration system and a conventional aerated stabilization basin for the treatment of 4.5 million gallons/day of waste water from a sulfite pulp mill is presented. The deep-tank aeration system is in reality a vertical flow reactor which takes advantage of the large partial pressure driving force for oxygen transfer at the bottom of the tank. The analysis consists of modeling oxygen transfer in deep tanks and designing a minimum-cost deep-tank treatment process. The deep tank system is designed with standby capacity for pumps, compressors, deep tanks, and a settling tank to insure continuous operation. The economic analysis indicates that the deep-tank system requires a capital investment of \$647,000 which is 10% lower than that for the aerated basin. The deep-tank system also results in a 58% reduction in total electrical energy usage. (Kreager-FIRL)
W77-03580

CONDUCTING SEWER SYSTEM EVALUATIONS FOR SMALL SYSTEMS.
P. E. Darnell.
Water and Sewage Works, Vol. 123, No. 11, p 68-71, November, 1976.

Descriptors: *Sewerage, *Sewers, *Infiltration, *Inflow, *Evaluation, Data processing, Analytical techniques, Monitoring, Inspection, Cleaning, Repairing, Surveys, Cost analysis, Flow.
Identifiers: *Infiltration/inflow.

Various aspects of an Infiltration/Inflow Analysis were described. This analysis applied to sewer systems with a total installed length of lines of 200,000 ft or less. Its function was to determine system susceptibility to excessive infiltration/inflow. Detailed descriptions were given for the three phases of analysis (evaluation survey, physical survey, and data analysis). Accurate flow data was a prime prerequisite in making all determinations. Smoke testing for leaks, observation during a rainfall or a rainfall simulation, and monitoring of groundwater levels in the system were important considerations. Preliminary data analysis involved an estimation of the quantity of water needed in a line section to justify costs of cleaning, inspecting, and rehabilitating the line. Consideration was also given to the option of replacement work. This was followed by a preparatory cleaning and internal inspection of the lines. Advantages and disadvantages of cleaning systems were compared. These activities were followed by an evaluation survey and the preparation of cost estimates for needed work. (Collins-FIRL)
W77-03581

NATURE PRESERVATION ACTIVITY RR INVESTIGATION: PART 6. A MODIFIED METHOD OF MEASURING THE CHEMICAL OXYGEN DEMAND GIVES A HIGH ANALYTICAL CAPACITY. (IN SWEDISH).
Uppsala Kommun Naturvårdsverkets RR-Under-sökning (Sweden). Algestab. Fysiol. Bot.
For primary bibliographic entry see Field 5A.
W77-03589

5E. Ultimate Disposal Of Wastes

RENOVATION OF MUNICIPAL WASTE-WATER FOR GROUNDWATER RECHARGE BY THE LIVING FILTER METHOD.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W77-03147

LIMING FARMLAND WITH CALCIUM SLUDGE.
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-03163

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Treatment and Quality Alteration—Group 5F

LAND BASED SEWAGE SLUDGE MANAGEMENT ALTERNATIVES FOR LOS ANGELES: EVALUATION AND COMPARISON, California Univ., Los Angeles. School of Architecture and Urban Planning. For primary bibliographic entry see Field 5D. W77-03289

RESIDUAL WASTE MANAGEMENT RESEARCH AND PLANNING PROJECTS, SEPTEMBER 1975, Environmental Protection Agency, Washington, D. C. Water Planning Div. For primary bibliographic entry see Field 5B. W77-03355

REACTIONS OF HEAVY METALS WITH SOILS WITH SPECIAL REGARD TO THEIR APPLICATION IN SEWAGE WASTES, Melbourne Univ., Parkville (Australia). Dept. of Agricultural Chemistry. For primary bibliographic entry see Field 5B. W77-03359

SLUDGE COLLECTOR AND LIGHT LIQUID SEPARATOR-FROM SEWAGE WITH TWO TANKS IN SINGLE HOUSING AND COVER. For primary bibliographic entry see Field 5D. W77-03405

COMBINED PROCESS OF PYROLYSIS AND COMBUSTION FOR SLUDGE DISPOSAL, Kyoto Univ. (Japan). Faculty of Engineering; and Kyoto Univ. (Japan). Dept. of Sanitary Engineering. For primary bibliographic entry see Field 5D. W77-03415

SLUDGE DEWATERING PILOT PLANT DESIGN, PART I, New Jersey Inst. of Tech., Trenton. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5D. W77-03416

SLUDGE INCINERATION, Environmental Science and Technology, Vol. 10, No. 12, p 1080-1082, November, 1976. 2 tab, 6 ref.

Descriptors: *Sewage treatment, *Sewage sludge, *Sludge treatment, *Incineration, *Sludge disposal, Metals, Pesticides, Polychlorinated biphenyls. Identifiers: Multiple-hearth incinerators, Fluidized-bed incinerators, Particulates.

Incineration of sewage plant sludge is discussed and compared to other methods of sludge control. EPA studies have proved sludge incineration adequate in meeting present air quality standards. This is true of both multiple-hearth and fluidized-bed incinerators. A 1972 study noted that most sludge incinerators of the time did not use high-efficiency particulate control devices and traces and small quantities of specific metals, PCBs, and pesticides could be found in stack emissions. Particulate control is a part of all sewage sludge incinerators now. Most metals either oxidize and are collected in the bottom ash or are collected during the particulate scrubbing phase. Sludge incinerators have been proven to destroy 99% of pesticides and 94% of PCBs when they are coincinerated with sludge. In terms of overall economics, sludge incinerators have proven to be half as costly as land application in Boston, Massachusetts. The same study rated incineration slightly better in terms of environmental impacts. It is also the best alternative to ocean disposal in the near future. The ash is free of pesticides, viruses, and pathogens, and easily transported to landfill sites. (Collins-FIRL) W77-03419

WASTE-TREATMENT 'FARM' HARVESTS FIRMS. For primary bibliographic entry see Field 5D. W77-03420

USE OF SLUDGE LEFT AFTER WASTE WATER DECONTAMINATION AS A FERTILIZER OR SOIL CONDITIONER (LES BOUES DE DECONTAMINATION D'EAU RESIDUAIRES UTILISEES COMME FERTILISANT OU COMME CONDITIONNEUR DE SOLS), For primary bibliographic entry see Field 5D. W77-03421

SLUDGE - WHERE WILL WE PUT IT, CH2M/Hill, Corvallis, Oreg. R. F. Haines. Water and Wastes Engineering, Vol. 13, No. 7, p 60, 62, 64, 66, July, 1976. 2 fig.

Descriptors: *Sludge disposal, *Sludge treatment, *Waste water treatment, *Costs, Landfills, Lagoons, Recycling, Fertilizer, Incineration.

The problem of sludge disposal has become one of major importance. Estimates place the cost of sludge treatment and disposal at 25 to 50% of total waste water management costs in the United States. Until now, purification was the main objective of treatment. The EPA is setting standards for treatment and the management of resultant residues. Landfill disposal is losing ground to other disposal options. Lagooning, ocean disposal, use as fertilizer, use of sludge-derived methane, and incineration have become attractive alternate methods. Future emphasis will be on improved operating techniques, recycling and minimizing waste streams, and on holding down water costs. Social, economic, and environmental factors must be included in all future planning. (Collins-FIRL) W77-03424

SMALL VILLAGE GETS ADVANCED TREATMENT. For primary bibliographic entry see Field 5D. W77-03440

LARGE SCALE SEWAGE TREATMENT PLANT WITH SLUDGE INCINERATOR. For primary bibliographic entry see Field 5D. W77-03442

AN OPERATOR'S APPROACH TO AEROBIC DIGESTER SUPERNATANT DISPOSAL PROBLEMS, Montgomery County Sewer Authority, Oaks, Pa. For primary bibliographic entry see Field 5D. W77-03449

INTERMITTENT SAND FILTRATION OF HOUSEHOLD WASTEWATER, Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5D. W77-03452

SEWAGE SLUDGE TREATMENT SYSTEM, California Inst. of Tech., Pasadena, Calif. (Assignee). For primary bibliographic entry see Field 5D. W77-03487

FLUIDIZED WASTE INCINERATOR AND METHOD, Shell Oil Co., Houston, Tex. (Assignee). For primary bibliographic entry see Field 5D. W77-03489

SLUDGE DRYING BEDS ARE PRACTICAL: PART 2. For primary bibliographic entry see Field 5D. W77-03572

WASTEWATER'S FUTURE IS CLOUDY, For primary bibliographic entry see Field 5D. W77-03577

THOSE NASTY PHOSPHATIC CLAY PONDS, For primary bibliographic entry see Field 5G. W77-03596

5F. Water Treatment and Quality Alteration

RESEARCH NEEDS FOR THE POTABLE REUSE OF MUNICIPAL WASTEWATER, Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5D. W77-03356

NATIONAL SAFE DRINKING WATER STRATEGY, ONE STEP AT A TIME, Environmental Protection Agency, Washington, D. C. Office of Planning and Evaluation. For primary bibliographic entry see Field 5G. W77-03357

PRELIMINARY ASSESSMENT OF SUSPECTED CARCINOGENS IN DRINKING WATER: REPORT TO CONGRESS, Environmental Protection Agency, Washington, D. C. Office of Toxic Substances. For primary bibliographic entry see Field 5A. W77-03360

PRECAUTIONS TO BE TAKEN IN THE CONSTRUCTION AND MAINTENANCE OF WATER SUPPLY AND SEWER SYSTEMS (PRECAUTIONS A PRENDRE DANS LA CONSTRUCTION ET L'ENTRETIEN DES RESEAUX D'AQUEDUC ET D'EGOUT), For primary bibliographic entry see Field 8G. W77-03400

'GIVE FLOTATION A TRY' WAS CHALLENGED, New Civil Engineer, p 16, June 10, 1976.

Descriptors: *Flotation, *Filtration, *Water treatment, Water quality, Separation techniques, Flocculation, Surface waters, Sludge disposal, Sludge treatment, Treatment facilities, Sedimentation, Costs.

The water authorities of Britain were urged to consider flotation as an alternative to filtration in water treatment. Claims based on Scandinavian experiences indicated that treated water quality is such that final filtration is sometimes unnecessary. It was suggested that thorough flocculation and separation tests would speed use of the flotation process in most surface water treatment plants. Advocates of the system have claimed several advantages for the process: smaller tank sizes with surface loading up to 10 times that of sedimentation tank loading, reduced chemical usage due to lighter flocs used, higher treated water quality from better solids recovery, and drier sludge. However, there would be higher energy costs and increased maintenance requirements due to the greater mechanical equipment needed. With the benefits of improved sludge handling and cheaper disposal, flotation has some cost advantage over sedimentation and, if filtration could also be replaced, the system could provide substantial financial savings. (Collins-FIRL) W77-03439

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5F—Water Treatment and Quality Alteration

MODEL STUDIES IN AQUEOUS CHLORINATION: THE CHLORINATION OF PHENOLS IN DILUTE AQUEOUS SOLUTIONS.
Waterloo Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-03458

EFFECT OF WATER CHLORINATION UPON LEVELS OF SOME POLYNUCLEAR AROMATIC HYDROCARBONS IN WATER.
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
R. M. Harrison, R. Perry, and R. A. Wellings.
Environmental Science and Technology, Vol 10, No 12, p 1151-1156, November, 1976. 12 fig, 3 tab, 16 ref.

Descriptors: *Water treatment, *Chlorination, *Treatment facilities, *Temperature, Hydrogen ion concentration, Laboratory tests, Sampling, Water analysis, Analytical techniques, Organic compounds.

Identifiers: Polynuclear aromatic hydrocarbons (PAH).

Eight polynuclear aromatic hydrocarbons (PAH) were subjected to chlorination and the results were evaluated against PAH removal at a water treatment plant. In lab tests, PAH's and a chlorinating agent were added to three aliquots of distilled water with one aliquot of distilled water as a blank. Various values of temperature, contact time, and reagent concentrations were tested. For comparison, samples from water treatment works were collected in glass vessels and extracted and analyzed by gas-liquid chromatography. The study revealed a 64-88% PAH removal by chlorination as compared to water treatment plant removal of about 60%. This difference is probably due to impurities in the water. Temperature, pH, and the concentrations of PAH and chlorinating agent have varying effects on PAH removal. Efficient filtration in treatment plants removes a substantial amount of PAH and chlorination furthers the process. (Collins-FIRL)
W77-03459

MONITORING OF COMMUNITY WATER SUPPLIES.
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5A.
W77-03463

INVESTIGATIONS ON THE IMPORTANCE OF THE ORGANIC CHLORO-COMPOUNDS AND THEIR ADSORBABILITY
(UNTERSUCHUNGEN ZUR BEDEUTUNG DER ORGANISCHEN CHLORVERBINDUNGEN UND IHRER ADSORBIERBARKEIT).
For primary bibliographic entry see Field 5A.
W77-03465

ULTRAVIOLET PURIFICATION SYSTEM.
For primary bibliographic entry see Field 5A.
W77-03467

RAPID DETECTION OF BACTERIAL ENDOTOXINS IN DRINKING WATER AND RENOVATED WASTE WATER.
Texas Univ. Health Science Center at San Antonio. Dept. of Pathology.
For primary bibliographic entry see Field 5A.
W77-03474

FLOTATION FOR WATER AND WASTE-WATER TREATMENT.
For primary bibliographic entry see Field 5D.
W77-03576

5G. Water Quality Control

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY. PROGRESS REPORT.
Allen County Soil and Water Conservation District, Fort Wayne, Ind.

J. E. Lake, and J. Morrison.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 104. Price codes: A11 in paper copy, A01 in microfiche. Report EPA-905/9-75-006, November 1975. 231 p, 106 fig, 90 tab, append. EPA G-005103.

Descriptors: *Water quality, *Land use, Agriculture, *Erosion, *Indiana, Sediments, Sedimentation, Suspended solids, Watersheds (Basins), Rivers, Nutrients, Pollutants, Fertilizers, Social aspects, Economics, Economic impact, Soil conservation, Farm management, Water pollution, Water pollution sources, Water pollution control. Identifiers: *Black Creek (Ind), *Maumee River Basin (Ind).

The Black Creek Sediment Study is an attempt to discover the role that agricultural operations play in the pollution of the Maumee River and to show how that role can be diminished through the application of significant land treatment practices. The project represents a multi-agency, multi-discipline approach to the total problem of non-point source pollution. The problem of non-point source pollution is becoming more and more important in the nation's overall effort to clean up the degraded streams and lakes. As major point sources of pollution such as industries and municipalities are brought under control and begin to contribute less and less of the total pollutant load, the necessity of controlling pollution which originates from small, hard-to-identify sources becomes more and more critical. Our understanding of the mechanisms by which pollutants from diverse small sources is carried into the nation's waterways to become - in the aggregate - a large problem is not so advanced as is our understanding of the monitoring and control of point-source pollution. The Black Creek project is intended to provide significant data on which future decisions about efforts to control this type of pollution - if it indeed can be controlled at a cost that all citizens are willing to bear - can be based. Two years of operation of this project were described and significant results were reported. (Sims-ISWS)
W77-03106

EFFECTS OF POTASSIUM ON ADULT ASIATIC CLAMS, CORBICULA MANILENSIS.
Illinois Natural History Survey, Urbana.
For primary bibliographic entry see Field 5C.
W77-03119

LOCAL WATER SYSTEMS ARE FREQUENTLY NEGLECTED.
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-03121

UTILIZATION OF MUNICIPAL WASTE WATER FOR FROTH FLOTATION OF COPPER AND MOLYBDENUM SULFIDES.
Arizona Bureau of Mines, Tucson.
For primary bibliographic entry see Field 5D.
W77-03132

APPLICATION OF A MODEL FOR LAYOUT AND DESIGN OF SEWER SYSTEMS.
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-03133

PRACTICAL ALTERNATIVES TO 2,4,5-T FOR CHEMICAL CONTROL OF BRUSH ALONG DRAINAGE DITCHES AND GENERAL WATERSHED USE.
Purdue Univ., Lafayette, Ind. Water Resources Research Center.

D. J. Morre.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 217. Price codes: A02 in paper copy, A01 in microfiche. Purdue Water Resources Research Center Technical Report No. 83, 1976, 11 p, 2 fig, 3 tab. OWRT A-049-IND(1).

Descriptors: *Herbicides, *Brush control, Drainage, *2,4-D, *2,4,5-T, *Chemical control, Watershed management, Organic compounds. Identifiers: Dicamba mixtures, Krenite mixtures, Environmental safety, *Drainage ditches.

The objective was to provide a practical alternative to 2,4,5-T as a brush control agent for general watershed use. Two such agents are described and specific recommendations are made for ditchbank and other watershed uses. The agents are (1) a 3-way Phenoxy-Dicamba mixture consisting of equal parts of an amine salt formulation of 2,4-D (2,4-dichlorophenoxyacetic acid), 2,4,5 TP (Silvex or 2,4,5-trichlorophenoxypropionic acid) and dicamba (Banvel or 3,6-dichloro-o-anisic acid) and (2) Krenite (ammonium ethyl carbamoylphosphonate) plus a nonionic surfactant (Surfactant WK, Tween 20, or Triton X-100 or equivalent product). The 3-WAY Mix gives the broadest control of species; Krenite has a slight edge in overall safety, but is restricted to use for ground application.
W77-03168

MULTIPLE USE IN THE SOUTHERN COASTAL PLAINS IN THE UNITED STATES.
Georgia Univ., Athens. School of Forest Resources.

For primary bibliographic entry see Field 4C.
W77-03173

OLYMPIC ALLIANCE OIL SPILLAGE.
Oil Pollution South East Kent, Dover (England).
For primary bibliographic entry see Field 5C.
W77-03195

PHYSICOCHEMICAL AND BIOLOGICAL CONDITIONS IN TWO OKLAHOMA RESERVOIRS UNDERGOING ARTIFICIAL DESTRATIFICATION.
Oklahoma State Univ., Stillwater. Dept. of Agriculture Engineering.
For primary bibliographic entry see Field 2H.
W77-03208

ORGANIC PHOSPHORUS IN LAKES.
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W77-03210

LAND BASED SEWAGE SLUDGE MANAGEMENT ALTERNATIVES FOR LOS ANGELES: EVALUATION AND COMPARISON.
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 5D.
W77-03289

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST REPORT.

Army Engineer District, Savannah, Ga.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 883. Price codes: A05 in paper copy, A01 in microfiche. June 1973. 73 p, 43 fig, 9 tab, 11 ref.

Descriptors: *Water quality, *Lakes, *On-site investigations, *Georgia, *Destratification, On-site data collections, Surveys, Evaluation, Instrumentation, Data collections, Reservoirs, Stratification, Dissolved oxygen, Water temperature, Nitrate, Nitrites, Nitrogen, Manganese, Carbon dioxide, Pumps, Air, Biota, Plankton, Phosphates, Alkalinity, Hydrogen ion concentration, Iron, Thermal stratification, Thermocline.
Identifiers: *Allatoona Lake(Geo).

An experimental field investigation was conducted at the Allatoona Lake Project during 1968, 1969, and 1970. The purposes of the investigation were: (1) to determine the effects of the operation of destratification equipment, specifically a diffused air pump, on the water quality of Allatoona Lake and releases therefrom, and (2) to develop criteria for design and operation of similar equipment at other impoundment projects. The diffused air pump was located about 2,000 feet upstream from the Allatoona Dam. The destratification results were evaluated using available data of the project for 1966 and 1970, a mathematical model for predicting water temperature, and a multiple regression model for predicting dissolved oxygen. Dissolved oxygen isopleths of the Allatoona Lake showed that the diffused air pump operation possibly affected dissolved oxygen concentrations in a zone extending about four miles upstream from the dam. The diffused air pump operation reduced the stability, or intensity, of thermal stratification in the lake. Operation of the air pump seemingly had little short term effect on the benthic and planktonic communities within the lake. Qualitative studies of the benthic biota downstream from the dam indicated a more diverse community during 1968 and 1969, possibly from the increased dissolved oxygen in the releases from the lake. Bacteriological data obtained in the lake near the diffuser units did not show any significant effect of artificial destratification on coliform density or vertical distribution of these bacteria. (See W77-03307 thru W77-03310) (Humphreys-ISWS)
W77-03306

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX A, OPERATIONAL AND WATER QUALITY DATA, 1968.
Army Engineer District, Savannah, Ga.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 884. Price codes: A12 in paper copy, A01 in microfiche. February 1969. 273 p.

Descriptors: *Basic data collections, *Reservoirs, *Water quality, *Georgia, *Destratification, Equipment, Operations, Meteorological data, Precipitation(Atmospheric), Wind velocity, Solar radiation, Evaporation, Air temperature, Water levels, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Conductivity, Turbidity, Biochemical oxygen demand, Hardness(Water), Alkalinity, Color, Nitrogen, Carbon dioxide, Coliforms, Secchi disks, Sulfides, Phytoplankton, Phosphates, Iron, Manganese.
Identifiers: *Allatoona Lake(Geo).

Appendix A contained tabulated data obtained in 1968 for an experimental field investigation conducted at the Allatoona Lake Project. Data tabulated for operation of destratification equipment included total KW-Hrs input, compressor hours operation, compressor pressure, compressor air flow, and air temperature at compressor manifold. Reservoir and meteorological data included pool elevation, precipitation, maximum and minimum air temperature, wind velocity, and total solar radiation. Water quality data included water temperature, dissolved oxygen, pH, conductivity, turbidity, total and dissolved iron, total and dissolved manganese, 2-day BOD, 5-day BOD, total hardness as CaCO₃, total alkalinity as CaCO₃, color, sulfide, carbon dioxide, total and dissolved phosphate, kjeldahl (N), NH₃-N, NO₃ + NO₂, total and fecal coliform per 100 ml, fecal

streptococci, secchi disc readings, benthos standing crop, and phytoplankton population. (See also W77-03306) (Humphreys-ISWS)
W77-03307

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX B, OPERATIONAL AND WATER QUALITY DATA, 1969.
Army Engineer District, Savannah, Ga.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 925. Price codes: A12 in paper copy, A01 in microfiche. February 1970. 251 p.

Descriptors: *Basic data collections, *Reservoirs, *Water quality, *Georgia, *Destratification, Equipment, Operation, Meteorological data, Precipitation(Atmospheric), Wind velocity, Solar radiation, Evaporation, Air temperature, Water levels, Water temperature, Inflow, Cooling water, Humidity, Discharge(Water), Dissolved oxygen, Hydrogen ion concentration, Conductivity, Turbidity, Chemical oxygen demand, Iron, Manganese, Hardness(Water), Alkalinity, Nitrogen, Carbon dioxide, Coliforms, Phosphates, Sulfides, Secchi disks.
Identifiers: *Allatoona Lake(Geo).

Appendix B contained tabulated data obtained in 1969 for an experimental field investigation conducted at Allatoona Lake Project. Data tabulated for operation of destratification equipment included total KW-Hrs input, compressor hours operation, compressor pressure, compressed air flow, and air temperature at compressor manifold. Reservoir and meteorological data included maximum and minimum air temperatures, maximum and minimum relative humidity, wind velocity, precipitation, pan evaporation, cooling water temperature, total solar radiation, pool elevation, tailwater elevation, total inflow, and total discharge. Water quality data included water temperature, dissolved oxygen, pH, conductivity, turbidity, total and dissolved iron, total and dissolved manganese, COD, CO₂, total hardness as CaCO₃, total alkalinity as CaCO₃, sulfide, total and dissolved phosphate, kjeldahl (N), NH₃-N, NO₃ + NO₂, total and fecal coliform per 100 ml, and secchi disc readings. (See also W77-03306) (Humphreys-ISWS)
W77-03308

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX C, OPERATIONAL AND WATER QUALITY DATA, 1970.
Army Engineer District, Savannah, Ga.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 926. Price codes: A07 in paper copy, A01 in microfiche. February 1971. 117 p.

Descriptors: *Basic data collections, *Reservoirs, *Water quality, *Georgia, *Destratification, Meteorological data, Precipitation(Atmospheric), Wind velocity, Solar radiation, Evaporation, Air temperature, Water levels, Inflow, Discharge(Water), Cooling water, Humidity, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Conductivity, Turbidity, Iron, Manganese, Chemical oxygen demand, Carbon dioxide, Hardness(Water), Alkalinity, Nitrogen, Phosphates, Sulfides, Coliforms, Secchi-disks, Light penetration.
Identifiers: *Allatoona Lake(Geo), Total organic carbons.

Appendix C contained tabulated data obtained in 1970 for an experimental field investigation conducted at the Allatoona Lake Project. Reservoir and meteorological data tabulated included pool elevation, tailwater elevation, total discharge, total inflow, precipitation, pan evaporation, maximum and minimum air temperatures, cooling water temperature, total solar radiation, maximum and minimum relative humidity, and wind velocity. Water quality data included water tem-

perature, dissolved oxygen, pH, conductivity, turbidity, total and dissolved iron, total and dissolved manganese, COD, CO₂, total hardness as CaCO₃, total alkalinity as CaCO₃, sulfide, total and dissolved phosphate, kjeldahl (N), NH₃-N, NO₃ + NO₂, total and fecal coliform per 100 ml, secchi disc readings, effective light penetration, and TOC. (See also W77-03306) (Humphreys-ISWS)
W77-03309

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX D, EFFECTS OF ARTIFICIAL DESTRATIFICATION ON TEMPERATURE AND DISSOLVED OXYGEN IN ALLATOONA RESERVOIR.

Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 927. Price codes: A07 in paper copy, A01 in microfiche. June 1971. 139 p., 16 fig, 8 tab, 31 ref, 1 append. DACW 21-70-C-0008.

Descriptors: *Water quality, *Reservoirs, *Model studies, *Water temperature, Computer programs, Mathematical models, Analytical techniques, Equations, Dissolved oxygen, Forecasting, Lakes.
Identifiers: *Allatoona Lake(Geo).

Field studies were conducted at the Allatoona Lake Project during 1968, 1969, and 1970 to investigate the feasibility of and effects resulting from use of diffused air pump destratification equipment on the lake water quality. Dissolved oxygen and water temperatures within the reservoir and in its releases are of primary importance as measures of the water quality. Appendix D describe a water temperature predictive model that had been developed. The goal was to use 1970 Allatoona data to verify the model's applicability to Allatoona, and then to use the model to predict 1969 temperatures in the reservoir. The predicted results indicated that calculated values do follow the trend of observed values, but the results were too crude to be used for anything except generalized predictions. The assumptions made in the model were too coarse, and a more satisfactory model for oxygen content must be sought. An appendix contained the details for the deep reservoir simulation model computer program. (See also W77-03306) (Humphreys-ISWS)
W77-03310

ANALYTICAL STUDIES FOR ASSESSING THE IMPACT OF SANITARY SEWAGE FACILITIES OF DELAWARE COUNTY, OHIO.
Enviro Control, Inc., Rockville, Md. Environmental Studies Group.
For primary bibliographic entry see Field 5D.
W77-03353

NATIONAL SAFE DRINKING WATER STRATEGY, ONE STEP AT A TIME.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 436. Price codes: A05 in paper copy, A01 in microfiche. May, 1975. 77 p., 2 fig, 5 tab.

Descriptors: *Legislation, *Potable water, *Public health, *Water quality standards, *Water policy, Groundwater, Underground, Injection, Programs, Federal project policy, Federal government, *Water pollution control.
Identifiers: Safe Drinking Water Act.

A safe drinking water strategy which has been developed to clarify the Environmental Protection Agency's policy with respect to implementing the Safe Drinking Water Act is described. The strategy proposes the following principles for implementing the Act: a commitment to give highest priority to public health matters; the involvement of states, local governments, and consumers in all

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

aspects of the program; the consideration of worst problems first; a consideration of the costs involved in all phases of the program; maximum utilization of existing state and local water supply control programs; decentralization of decision-making to Environmental Protection Agency regional offices; a consideration of the environmental side effects of actions taken under the Act; and the minimization of 'red-tape' in all actions. The Environmental Protection Agency also plans to implement an underground injection control program prescribed by the Act with the same step-by-step approach. (Kreager-FIRL)
W77-03357

DELAWARE 1975 STATE WATER QUALITY INVENTORY.

Department of Natural Resources and Environmental Control, Dover, Dela. Div. of Environmental Control.

N. C. Vasuki, and J. L. Pase.

April 1975. 219 p. 59 fig., 3 tab., 29 charts, 2 ref.

Descriptors: *Water quality standards, *Delaware, Federal Water Pollution Control Act, Water pollution, Eutrophication, Sedimentation, Coliforms, Water quality, Waste water treatment, Costs, Pollution abatement, Surveys.

Identifiers: *State Water Quality Inventory (Delaware), *Nonpoint source pollution.

Delaware water quality was assessed in accordance with the requirements of the Federal Water Pollution Control Act Amendments of 1972. Water quality in Delaware was generally considered good. A major exception was a portion of the Delaware River, which will require upgrading of major Pennsylvania and New Jersey treatment facilities. Of the 20 segments in the state, 6 appeared to meet all or most water quality criteria, 7 have had occasional problems, and 7 have had continuing problems in more than one water quality parameter. The tidal portion of ten segments were significantly affected by non-point source pollution from natural estuarine system processes. Excess bacteria counts were the major surface water problem, resulting primarily from urban and rural runoff, and waterfowl and wildlife. Lake degradation due to sedimentation and eutrophication was also significant. Heavy metals and toxic materials were not major problems. Point source discharge was important in certain segments, particularly those with limited assimilative capacity. Leachate from landfills, severe drawdown from wells in coastal areas, and on-site waste disposal systems contributed to contamination of ground-water aquifers. Major water quality accomplishments during the 1970-1974 period were reported along with cost estimates of providing wastewater treatment facilities through 1990. (Luedtke-Wisconsin)
W77-03378

WATER POLLUTION SURVEILLANCE IN THE UNITED STATES. REPORT NUMBER 1, MISSOURI RIVER MAIN STEM, 1958-1962.

Public Health Service, Washington, D. C. Water Quality Section.

For primary bibliographic entry see Field 5A.
W77-03379

GREAT LAKES WATER QUALITY; FOURTH ANNUAL REPORT TO THE INTERNATIONAL JOINT COMMISSION.

International Joint Commission-United States and Canada. Great Lakes Water Quality Board.
July 1976. 162 p. 19 tab., 9 fig., 4 append.

Descriptors: *International Joint Commission, Great Lakes, Governments, Canada, Water law, Legal aspects, International waters, International law, Water quality, Water quality control, International commissions, Water pollution effects, Dredging, Land use, Navigation, Toxicity, Toxins.

Identifiers: *Great Lakes Water Quality Board.

A comprehensive review is made of the quality of the U.S.-Canadian boundary waters and of programs and problem areas for which attention is mandated by the countries' Great Lakes Water Quality Agreement. Detailed examinations are provided for nearshore problem areas, programs for the construction of municipal wastewater treatment plants, measures to reduce phosphorus inputs to the lakes and industrial waste treatment programs. Other problem areas covered deal with toxic substances and radioactivity in the Great Lakes and with government programs to reduce their impact on the boundary waters. Dredging, land use and shipping activities are reviewed for their impact on water quality in the region. To mark the start of the fifth year of the agreement, the Great Lakes Water Quality Board presents a proposed framework for completing the implementation of the pact and for improving its effectiveness. Strategies are presented to cope with new problems or with those which might emerge in the future. Revised water quality objectives are proposed, along with an International Great Lakes Surveillance Program designed to provide basic information needed to show progress in achieving the objectives. (Harris-Wisconsin)
W77-03383

ORIGIN OF NITROGEN POLLUTION IN SURFACE AND WASTE WATERS (ORIGINES DES POLLUTIONS AZOTÉES DANS LES EAUX SUPERFICIELLES ET LES EAUX USEES).

For primary bibliographic entry see Field 5D.
W77-03423

INFILTRATION/INFLOW - THE KANSAS CONNECTION.

Black and Veatch, Kansas City, Mo.

M. J. Graham, C. W. Duncan, and J. R. Kirby.

Water Pollution Control Federation Highlights, Vol. 13, No. 9, p D2-5, September, 1976. 1 fig, 1 tab.

Descriptors: *Infiltration, *Inflow, *Kansas, *Treatment facilities, *Sewers, Flow rates, Infiltration rates, Cities, *Waste water treatment.

Identifiers: *Infiltration/inflow.

The requirement of PL 92-500 that applicants for federal funds for new treatment works or system improvements must determine any excessive infiltration/inflow, has produced guidelines for such a study. There should be a preliminary infiltration/inflow study and, if an excess is found, a sewer system evaluation survey is required to determine the location, extent, and flow rate of the infiltration/inflow. A summary of several studies conducted for Kansas municipalities is reported. The analyses indicated that sewer cross-connections, broken pipes, defective joints, ill-fitting manhole lids, and manholes located in low areas with lids having holes in them that serve as area drains are probable sources. House service lines, approximately 50% of a sewer system, provide numerous potential infiltration/inflow sources. Several suggestions for improving the situation include plugging sewer lines for razed and/or abandoned buildings, requiring new service from existing sewers to new structures or major remodeling of structures in older areas, replacing broken pipes and sewer lines, and repairing leaking manholes. Increasing pipe diameter by 30% produces an 80% flow increase with little additional costs and may be a useful alternative. This investigation concludes that a substantial part of infiltration/inflow is not readily identifiable or easily corrected and providing holding facilities and treating excessive flow at treatment facilities is more cost effective, generally. It was also noted that the flows on which the studies were based were not reliable and that correction of the situation should be a part of the continuing municipal budget. (Collins-FIRL)
W77-03479

GRANT AID FOR PLANT OPERATIONS: AN EVALUATION.

New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.

L. J. Hetling, I. G. Caracich, P. J. Mack, and J. C. Klimek.

Journal Water Pollution Control Federation, Vol. 48, No. 11, p 2529-2540, November, 1976. 2 fig, 4 tab, 1 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Grants, New York, State governments, Operations, Operation and maintenance, Construction.

A New York State Legislature study on its program of financial assistance in the construction, operation, and maintenance of waste water treatment plants was reported. The main goal of the program was to prevent deterioration of new treatment plants and to upgrade existing ones where feasible. In evaluating administrative costs, it was found that the program cost \$720 thousand annually or \$1 in administrative overhead for each \$25 given in grant. Rising expenditures were considered the result of an increase in eligible facilities, the greater costs of more efficient and complex plants, and general economic inflation. Most rejections under the program were due to removals less than design or deteriorating removals; lack of action on study and/or correction of flow measurements, hydrologic overloading, infiltration or storm water problems; raw waste water discharges or bypassing; and inadequate or no sampling and/or laboratory testing. The program was very helpful in improving secondary considerations such as plant performance, increasing inspection and repair operations, maintaining qualified personnel without political overstaffing, inspiring community sewer use ordinances, improving safety standards, and aiding compliance with pollution abatement orders. There are problems with this system which have hindered full participation by New York communities. Some were complicated by community dislike of outside inspections and supervision. Others were financial. In some cases the possible state funds would not be of sufficient benefit in improving treatment facilities and, often, costs involved in application for grants were detrimental inhibitors. (Collins-FIRL)
W77-03483

COLORADO WATER QUALITY CONTROL ACT.

For primary bibliographic entry see Field 6E.
W77-03490

INDIVIDUAL SEWAGE DISPOSAL SYSTEM ACT.

For primary bibliographic entry see Field 6E.
W77-03491

WATER POLLUTION.

For primary bibliographic entry see Field 6E.
W77-03495

CARLSON V VILLAGE OF WORTH (PREEMPTION OF LOCAL REGULATION OF SANITARY LANDFILL BY ENVIRONMENTAL PROTECTION ACT).

For primary bibliographic entry see Field 6E.
W77-03497

STATE DEPT OF POLLUTION CONTROL V INTERNATIONAL PAPER CO. (DETERMINATION OF FISH VALUE THAT WERE KILLED BY POLLUTANTS).

For primary bibliographic entry see Field 6E.
W77-03498

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

POISONING OF, AND OBSTRUCTION TO, FISH.

For primary bibliographic entry see Field 6E.
W77-03500

IRRIGATION AND WATER RIGHTS.

For primary bibliographic entry see Field 6E.
W77-03502

WATER, LIGHTING AND SEWERS.

For primary bibliographic entry see Field 6E.
W77-03506

PUBLIC INLAND LAKE PROTECTION AND REHABILITATION.

For primary bibliographic entry see Field 6E.
W77-03510

VILLAGE OF LOMBARD V STATE POLLUTION CONTROL BOARD (POLLUTION CONTROL BOARD WITHOUT AUTHORITY TO IMPOSE REGIONALIZATION UPON LOCAL GOVERNMENTAL BODIES).

For primary bibliographic entry see Field 6E.
W77-03511

COMMONWEALTH V. BARNES AND TUCKER COMPANY (PUBLIC NUISANCE OF ACID MINE DRAINAGE).

For primary bibliographic entry see Field 6E.
W77-03519

PAINT FORMULATING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS.

Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No 145, p 31724-26, July 28, 1975. 3 p.

Descriptors: *Paints, *Waste water treatment, *Standards, *Water pollution sources, Administrative agencies, Regulation, Solvents, Incineration, Navigable waters, Recycling, Costs, Economic impact, Federal government, Water quality, Treatment facilities, Water pollution treatment, Water quality control, Water quality standards, Pollutants, Effluents, Federal Water Pollution Control Act, Industries.
Identifiers: *Administrative regulations(EPA), *FWPCA Amendments of 1972.

The Environmental Protection Agency (EPA) is establishing final effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources in the oil-base solvent wash paint subcategory of the paint formulating point source category. For this subcategory, no discharge of process waste water pollutants is allowed either to navigable waters or to publicly owned treatment works since discharge of these pollutants would have a substantial damaging impact on water quality. The EPA notes that currently most plants are not discharging process waste water pollutants. Alternate treatment methods include solvent recovery and incineration. Members of the paint industry have commented that existing methods are not necessarily the equivalent of no discharge since discharge to a landfill or a municipal treatment system is a discharge. The EPA further states that recycling was systems reduce the volume of process waste water but do not completely eliminate it. (Capehart-Florida)
W77-03526

VIRGINIA STATE PROGRAM FOR CONTROL OF DISCHARGE OF POLLUTANTS TO NAVIGABLE WATERS; APPROVAL.

Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 40, No 9, p 20129-30, May 8, 1975. 2 p.

Descriptors: *Federal Water Pollution Control Act, *Virginia, *Permits, *Water pollution control, Pollutants, Pollutant identification, Water pollution, Water pollution sources, Programs, Federal government, State governments, Legal aspects, Administrative agencies, Regulation, Control, Water pollution effects, Bodies of water, Licenses.
Identifiers: *National Pollutant Discharge Elimination System.

The Environmental Protection Agency has granted the State of Virginia's request for approval of its program for controlling discharges of pollutants to navigable waters in accordance with the National Pollutant Discharge Elimination System (NPDES), pursuant to section 402(b) of the Federal Water Pollution Control Act. Section 402 of the Act establishes a system whereby permit may be issued for discharge of certain pollutants, and section 402(b) allows any state desiring to administer its own permit program for discharges into navigable waters within its jurisdiction to submit such a program to the Administrator for approval. The Virginia NPDES permit program is being administered by the Virginia State Water Control Board. (Hadoulis-Florida)
W77-03527

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT LIMITATIONS AND GUIDELINES (AMENDMENTS TO REGULATIONS-BUTADIENE).

Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No 233, p 56435-36, December 3, 1975. 2 p.

Descriptors: *Federal Water Pollution Control Act, *Chemical industry, *Chemical wastes, *Waste water treatment, *Standards, Regulation, Industries, Chemicals, Water pollution sources, Effluents, Pollutants, Water pollution, Water quality, Water quality control, Water quality standards, Administrative agencies, Federal government, Biochemical oxygen demand.
Identifiers: *Administrative regulations(EPA).

The Environmental Protection Agency is amending the regulation relating to effluent limitations and guidelines for the discharge of water pollutants generated by any manufacturing process using oxidative-dehydrogenation of n-butene or butylene. The effluent characteristics for which limitations are established are BOD₅, TSS and pH. These guidelines represent the degree of effluent reduction which can be attained by applying the best practicable control technology available at the present time. (Capehart-Florida)
W77-03528

PROPOSED TOXIC POLLUTANT EFFLUENT STANDARDS.

Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 113, p 23576-96 June 10, 1976. 21 p.

Descriptors: *Federal Water Pollution Control Act, *Pesticides, *Industrial wastes, *Effluents, *Standards, Regulation, Pollutants, Toxicity, Administrative agencies, Federal government, Water pollution, Water quality, Water quality standards, Aldrin, Dieldrin, DDD, DDE, DDT, Endrin, Pesticide toxicity, Public health, Persistence, Waste treatment, Waste water treatment, Water quality control.
Identifiers: *Administrative regulations(EPA), Carcinogens, Toxaphene.

The Environmental Protection Agency has proposed effluent standards for manufacturers

and formulators, both existing and new sources, for the following toxic pollutants: aldrin, dieldrin, DDT, DDD, DDE, endrin, and toxaphene. These substances are among the most highly toxic pesticides known, are persistent in the environment, are lethal to wildlife in low doses, bioaccumulate in aquatic organisms, and pose a threat of cancer to man. The proposed standards allow no aldrin, dieldrin, DDT, DDE, or DDD in any discharge. Permitted levels are established for endrin and toxaphene. Where a toxic pollutant is present in the intake water, an operator will not be required to remove it with the waste water treatment system. (Capehart-Florida)
W77-03529

SECONDARY TREATMENT INFORMATION; BIOCHEMICAL OXYGEN DEMAND, SUSPENDED SOLIDS AND PH.

Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 144, p 30786-88, July 26, 1976. 4 p.

Descriptors: *Water quality standards, *Regulation, *Water chemistry, *Biochemical oxygen demand, *Coliforms, Water quality, Standards, Water pollution, Water policy, Suspended solids, Administrative agencies, Governments, Disinfection, Legislation, Treatment, Treatment facilities, Waste water(Pollution), Federal Water Pollution Control Act.
Identifiers: *FWPCA Amendments of 1972, pH limitations, Secondary treatment.

The Environmental Protection Agency has proposed an amendment to the Secondary Treatment Information regulation contained in 40CFR Part 133 pursuant to sections 301 and 304 of the Federal Water Pollution Control Act Amendments of 1972. The proposed amendment deleted a section dealing with the limitations for fecal coliform bacteria and added 'special consideration' for clarification of pH limitations. The majority of comments received on the proposed rule changes indicated support for the proposed amendment. The proposed amendment for the deletion of fecal coliform limitations specified reliance on state water quality standards for establishing minimum disinfection requirements for publicly owned treatment works. A significant majority of the responding state agencies, responsible for setting and implementing water quality standards, supported the deletion. The amended version of Part 133 of Chapter I of Title 40 of the Code of Federal Regulations is set forth in the article. (Rieck-Florida)
W77-03530

MARINE SANITATION DEVICE STANDARD.

Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 20, p 4452-4, Jan 29, 1976. 3 p, 1 tab.

Descriptors: *Ships, *Sewage, *Water pollution, *Standards, *Environmental sanitation, Waste treatment, Boats, Water quality control, Great Lakes, Locks, Freshwater, Estuaries, Coasts, Effluents, Navigable waters, Non-navigable waters, Coliforms, Reservoirs, State jurisdiction, Federal government, Administrative agencies, Bodies of water, Lakes.
Identifiers: *Administrative regulations(EPA), *FWPCA Amendments of 1972.

As required by the 1972 Amendments to the Federal Water Pollution Control Act, the Environmental Protection Agency has established federal standards of performance for vessels on which marine sanitation devices have been installed. Comments from interested parties are included, as well as a table summarizing the federal marine sanitation device standards. The standard for freshwater lakes and non-navigable rivers requires that the marine sanitation devices must prevent

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

overboard discharge of sewage or sewage waste. In other waters the standard allows discharge but limits the fecal coliform bacterial count. A state may completely prohibit discharge of sewage into waters within the state by all vessels by making application to the Environmental Protection Agency. The requirements for approval of such as application are detailed. (Capehart-Florida)
W77-03531

UNIONS FIGHT A JONES ACT WAIVER.
For primary bibliographic entry see Field 6E.
W77-03532

THE HARD JOB OF SAVING LAKE ERIE.
Business Week, No. 2404, p 116, October 27, 1975.
1 p, 1 photo.

Descriptors: *Agricultural runoff, *Lake Erie, *Water pollution control, *Phosphorus, *Algae, Bodies of water, Great Lakes, Lakes, Surface waters, Aquatic environment, Aquatic microbiology, Water pollution effects, Water pollution sources, Water pollution treatment, Water quality. Identifiers: *FWPCA Amendments of 1972.

Lake Erie is a dying lake. The primary cause is the introduction of phosphorus from industrial and municipal sewage discharges and from agricultural runoff. Phosphorus stimulates the growth of algae, which die and decompose in late summer. The decomposition consumes all the dissolved oxygen in the lake's cool lower stratum. This condition, known as anoxia, lasts until the entire lake cools in autumn. The anoxia, in turn, causes a reaction that pumps up more phosphorus from the bottom sediments, which stimulates the growth of more algae. The lake is choking on its own regenerated pollution. Studies have been done in conjunction with the Water Pollution Control Act amendments of 1972 showing that costs to implement the required 'best available technology' will run over two billion dollars. While slow improvement is forecast, the future is not bright for a lake that has aged 15,000 years in the last 200. (Frank-Florida)
W77-03534

FEASIBILITY OF TRANSPLANTATION, REVEGETATION, AND RESTORATION OF EELGRASS IN SAN DIEGO BAY, CALIFORNIA.
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab. C. G. Boone, and R. E. Hoepfel. Available from the National Technical Information Service, Springfield, VA 22161 as AD/A021 484. Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper Y-76-2, February 1976. 47 p. 3 fig., 1 tab., 44 ref., 2 append. DACW09-75-B-0026.

Descriptors: *Marine plants, *Revegetation, Environmental effects, Feasibility, Costs, Shores, *California, Plant growth, Spoil banks, Bays, Methodology. Identifiers: *Eelgrass, *San Diego Bay(Calif), Zostera marina, Dredge spoil disposal, Transplantation.

The state of the art of eelgrass (*Zostera marina* L.) revegetation methodologies were evaluated in order to examine the possibility of preserving or replacing the eight-acre Delta Beach eelgrass bed programmed to become a dredged material disposal site. Feasibility of various transplantation and revegetation methods were considered along with site selection criteria, substrate-nutrient effects, temperature, light, and salinity effects, and eelgrass productivity and nutrient recycling. It is suggested that the eelgrass turions be harvested during the winter months prior to filling the dredge disposal site and broadcast into other areas of south San Diego Bay where patchy eelgrass beds already exist. Replanting of the Delta Beach areas should be postponed for a minimum of a year after

filling, to allow the substrate to become stabilized and consolidated. The plug method, an alternative approach to the turion method of transplantation, would likely be more productive, but being more labor-intensive would also be more costly. A comparison of the respective costs of these two methods is appended. It is also recommended that a pilot study be undertaken to more accurately determine the most cost effective and productive procedures. (Luedtke-Wisconsin)
W77-03546

CALIFORNIA'S GROUND WATER.
California State Dept. of Water Resources, Sacramento. Div. of Planning.
For primary bibliographic entry see Field 4B.
W77-03548

GROUND WATER BASIN PROTECTION PROJECTS: FREMONT SALINITY BARRIER.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 4B.
W77-03555

A MODEL FOR THE CONTROL OF DISSOLVED MANGANESE IN THE INTERSTITIAL WATERS OF CHESAPEAKE BAY.
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 5B.
W77-03556

INVESTIGATION OF THE PHYSICAL FEASIBILITY OF MOBILE FISH PROCESSING PLANTS.
Fisheries and Marine Service, Ottawa (Ontario). Research and Development Directorate.
For primary bibliographic entry see Field 6B.
W77-03558

DETERMINATION OF MAXIMUM PERMISSIBLE LEVELS OF SELECTED CHEMICALS THAT EXERT TOXIC EFFECTS ON PLANTS OF ECONOMIC IMPORTANCE IN ILLINOIS.
Southern Illinois Univ., Carbondale.
For primary bibliographic entry see Field 5A.
W77-03565

THE COST OF PRODUCING EFFLUENTS TO VARYING STANDARDS BY BIOLOGICAL TREATMENT TECHNIQUES.
For primary bibliographic entry see Field 5D.
W77-03568

THE MUDDY ROAD TO CLEAN WATER.
M. Green, and S. Flander.
American Forests, Vol 80, p 24-27, 56-59 (June 1974). 7 p, 8 photo.

Descriptors: *Federal Water Pollution Control Act, *Water Quality Act, *Legislation, *Water pollution control, *Project post-evaluation, Projects, Project planning, Project benefits, Programs, Water quality control, Water quality standards, Water quality, Water pollution treatment, Water policy, Water pollution, Administrative agencies, Project purposes. Identifiers: *FWPCA Amendments of 1972, *Administrative regulations, *Congressional hearings.

Federal effort to achieve clean water culminated in the Federal Water Pollution Control Act Amendments of 1972. These amendments were thought to be the most comprehensive ever, capable of restoring and maintaining the chemical, physical and biological integrity of the nation's waters. After seemingly endless optimism, the judgment is that, so far, the program has yet to get off the ground. Major criticism has been aimed at

the principal administrator of the program, the Environmental Protection Agency (EPA). Specific charges have been levied that guidelines promulgated by EPA are too complex and too far behind schedule, paperwork required is too extensive and that promised funding has not been forthcoming. Only half of the desired money for sewage treatment construction grants has been released and then only after numerous court battles. The effluent guidelines have not been promulgated on schedule and toxic pollutant standards have been virtually nonexistent. EPA has responded that the complexity of the program and the short time in which they were given to carry it out has prevented smooth implementation of program policies. (Welch-Florida)
W77-03587

IMPLEMENTING THE NATIONAL WATER POLLUTION CONTROL PERMIT PROGRAM: PROGRESS AND PROBLEMS.
Comptroller General Report to Subcommittee on Investigations and Review House Committee on Public Works and Transportation, p 1-85, February 1976. 85 p, 4 append.

Descriptors: *Water permits, *Water pollution control, *Effluents, *Water quality standards, *Industrial wastes, Financial feasibility, Monitoring, Permits, Water policy, Water pollution, Water quality, Water quality control, Water control, Regulations, Pollution abatement, Pollutants, Judicial decisions. Municipal wastes. Identifiers: *Point sources(Pollution), *National Pollutant Discharge Elimination System(NPDES).

Examined here are the problems affecting the National Pollutant Discharge Elimination System (NPDES) permit program. The program, which is administered by the Environmental Protection Agency, is intended to clean up the nation's waterways through issuance and enforcement of permits which define allowable effluent limitations. Legislation requires that compliance with these limits be met by July 1, 1977. However, this deadline may be unrealistic in light of three major problems confronting the program. First, a U. S. district court has ruled that the Environmental Protection Agency (EPA) must issue permits to all major and minor point source polluters. Because the Government Accounting Office believes that compliance with this ruling would present an almost impossible task it suggests new legislation giving the EPA the power to exempt minimum effect polluters. The second factor affecting timely implementation of the program is that many industrial law suits have been brought challenging the reasonableness of the permit requirements. Thirdly, the report states that insufficient federal funding has prevented many municipalities from constructing or upgrading their discharge facilities. Further, since neither the EPA nor the states plan to take enforcement actions against the municipalities, it is recommended that the deadline for municipal compliance be extended on a case-by-case basis. (Joseph-Florida)
W77-03588

ENVIRONMENTAL CONCERN AS A FACTOR IN COASTAL ZONE DEVELOPMENT: A STUDY OF LOUISIANA CITIZENS.
Louisiana State Univ., Baton Rouge. Dept. of Rural Sociology Research.
For primary bibliographic entry see Field 6G.
W77-03590

THE PEOPLE'S LAKE.
Save Lake Superior Association, Duluth, Minn. K. T. Carlson.
Environment, Vol 17, No 2, p 16-20, 25-26, March 1975, 7 p, 4 photo, 19 ref.

Descriptors: *Asbestos, *Industrial wastes, *Lake Superior, *Judicial decisions, *Minnesota, Water pollution sources, Great Lakes, Lakes, Surface

waters, Aquatic environment, Water pollution effects, Water pollution treatment, Water quality, Administrative agencies, Inorganic compounds. Identifiers: *Injunctive relief.

Reserve Mining Company of Silver Bay, Minnesota has been dumping 750 million gallons of wastewater, 67,000 tons of taconite waste, and 60,000 pounds of dissolved solids into Lake Superior each day. When the company was granted its permit in 1947, it was forbidden to do much of what it is doing today. The Save Lake Superior Association (SLSA) took the company to court, and in 1974 a District Court judge ruled that Reserve should be enjoined from continuing discharge. The fact that carcinogenic asbestos fibers were found in the waste played a large part in the decision. The trial judge's injunction was stayed by an appellate court, however, and on appeal the United States Supreme Court refused to overturn the stay. Instead, it urged that administrative solutions be sought. Unfortunately, this will prove a lengthy process due to Reserve's intransigence. Presently, a swampy area downlake is being studied as a potential land site for dumping. Obviously, some alternative to outright lake dumping must be found. The question raised here is whether federal, state and corporate authorities regard the problem as one requiring immediate solution. (Frank-Florida) W77-03594

THOSE NASTY PHOSPHATIC CLAY PONDS, Environmental Science and Technology, Vol 8, No 4, p 312-13, April 1974. 2 p, 1 chart.

Descriptors: *Florida, *Phosphates, *Phosphorous compounds, *Chemical wastes, *Dams, Dewatering, Filters, Filtration, Fluid friction, Fluid mechanics, Waste disposal, Ponds, Waste treatment, Waste storage, Waste dumps, Industrial wastes. Identifiers: Clay ponds.

Phosphatic clay ponds in Florida pose a serious threat to the environment. Held behind earth dams, they always have the potential to escape and heavily pollute any nearby waterways. Because of the damage that has been caused by recent dam failures, such as the Fort Meade Mine in 1971, the phosphate industry has investigated other methods of containing and removing such phosphatic wastes. Three major methods are explored: dewatering techniques, filtration, and cross-flow fluid bed dryers. While several dewatering techniques are technically feasible, such as freezing and solar evaporation, they have not proven economically feasible. Two methods, however, appear to be technically and economically feasible: straight mixing with tailings sand; and chemical flocculation together with coagulation with tailings sand. Both methods are currently undergoing field testing. Field testing is also planned for a new filtering system. In the past, filtering systems were plagued by clogging or blinding of the filter media. The University of Florida has apparently developed a new system that avoids these problems. Another new development concerns the bed dryer, which can dry slimes of 30% solids to a powder of 95-99% solids content with 75% fuel efficiency. The major problem with this method is in dewatering slimes to 30%. Hopefully, one of these methods will obviate the need for environmentally unsafe phosphatic slime ponds. (Frank-Florida) W77-03596

WATER RIGHTS, Wisconsin Univ., Madison. For primary bibliographic entry see Field 6E. W77-03599

THE WYOMING WATER QUALITY ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972: A COMPARISON, T.E. Orf.

Land and Water Law Review Vol 9, p 79-95 (1974). 17 p, 95 ref.

Descriptors: *Water quality act, *Water pollution sources, *Permits, *Wyoming, *Governmental interrelations, Penalties(Legal), Discharge(Water), Regulation, Water quality standards, State governments, Administrative agencies, Sewage treatment, Federal water pollution control act, Effluents, Interagency cooperation. Identifiers: *FWPCA Amendments of 1972.

The 1972 Amendments to the Federal Water Pollution Control Act authorized states to administer their own conforming permit programs. This article covers Wyoming's legislation directed toward that program, examines the compliance of the Wyoming act with federal requirements and predicts what further administrative regulation will be necessary to meet federal standards. Both the state and national acts set up a permit system for water pollution sources, with general limitations on the release of effluents. Also examined are the procedural process for permit application and how specific limitation standards can be developed. Required federal regulation which have been adopted by the state include provisions for public participation in the permit process, procedures for hearings, and the release of application information. The state acts compliance with federal regulations for terms and conditions of permits and of variance concessions will need administrative augmentation. The state is given authority to monitor pollution sources; enforcement provisions are included. W77-03600

6. WATER RESOURCES PLANNING

DEVELOPMENT OF HARDWARE AND PROCEDURES FOR IN-SITU MEASUREMENT OF CREEP IN SEA ICE, Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 2C. W77-03276

6A. Techniques Of Planning

USER ORIENTED SYSTEMS ANALYSIS FOR REGIONAL MUNICIPAL WATER SUPPLY PLANNING, Utah State Univ., Logan. Coll. of Engineering. P. E. Pagner, and T. C. Hughes. Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 243. Price codes: A06 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Publication PRWA23-1, July 1976. 113 p, 2 fig, 1 tab, 23 ref, 9 append. OWRT B-125-UTAH(2). 14-34-0001-6127.

Descriptors: Water supply, Planning, *Systems analysis, Optimization, *Regional analysis, Model studies, *Municipal water, Costs, *Linear programming, *Alternative costs, *Investment, Capital costs, Operating costs, Maintenance costs. Identifiers: Interactive data, Mixed integer programming.

An interactive data and model generator is developed that is intended to bridge the gap between planning engineers and the mathematical programming systems approach to municipal and regional water supply planning. The optimization objective is to minimize total annual cost of existing and future alternative source-related water supply facilities with respect to capital investment and operation and maintenance costs. A matrix generator is developed which formulates the necessary hydrologic, demographic and stochastic municipal water supply data into the format of a mixed integer linear programming problem for system optimization. The program then calls the integer programming algorithm, solves the op-

timization problem, and outputs a report in a format and language designed specifically for the problem at hand. All of this is accomplished in interactive mode with the user simply answering questions which are asked by the program. W77-03159

WATER RESOURCES OF AUSTRALIA AND THE PATTERN OF POPULATION CONCENTRATIONS, For primary bibliographic entry see Field 6D. W77-03278

SUPPLEMENT TO DOCUMENTATION OF FINITE-DIFFERENCE MODEL FOR SIMULATION OF THREE-DIMENSIONAL GROUND-WATER FLOW, Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 2F. W77-03329

USE OF HYBRID COMPUTER MODEL IN RESOURCE PLANNING, Central and Southern Florida Flood Control District, West Palm Beach. G. Shih. In Depth Report, Vol 3, No 2, p 1-12, Feb 1976. 12 p, 11 fig.

Descriptors: *Computer models, *Hybrid computers, *Water resources, *Model studies, *Planning, Simulation analysis, Water supply, Flood protection, Pollution control, Water pollution, Aquifers, Lakes, Structures, Groundwater, Saline water intrusion, Soil contamination, Analog models, Mathematical models, Digital computers, Systems analysis, Drawdown, Droughts.

Water resource planning requires consideration of a number of factors such as water supply, flood protection, pollution control, and environmental protection. Computer modelling is a widely used tool for studying such complex planning systems. The author suggests use of a hybrid computer, a combination of both a digital and an analog computer, as a feasible means for evaluating resource planning alternatives. The convenient and flexible input-output features and the data manipulation capability of the digital computer are complemented by the continuous solution capability of the analog computer. Analog groundwater simulation models have been used for analysis of draw downs, droughts, and developments of regional impact. A hybrid model has been used to simulate problems of salt water intrusion. Water resource problems which may be appropriate for hybrid modelling are surface water systems, soil and water pollution interactions, and ecological systems. (Capehart-Florida) W77-03523

USEFUL MODELING CONCEPTS FOR THE FCD WATER SYSTEM, Central and Southern Florida Flood Control District, West Palm Beach. A. N. Shahane, and R. L. Hamrick. In Depth Report, Vol 2, No 4, p 1-12, Sept-Oct 1974. 12 p, 3 fig, 2 tab.

Descriptors: *Simulation analysis, *Analytical techniques, *Hydrologic systems, *Water allocation(Policy), Systems analysis, Linear programming, Water sources, Computers, Water levels, Non-structural alternatives, Computer models, Flood control, Flood routing, Drainage systems, Water management(Applied), River basin development, Artificial water courses, Water resources development, Aquifers, Rainfall simulators, Statistical models.

The water system included in the flood control district is a modified, controlled system rather than a natural system. Therefore, it is not possible to

Field 6—WATER RESOURCES PLANNING

Group 6A—Techniques Of Planning

apply the techniques of conventional engineering analysis of natural streamflows to the system. Examples of the types of modeling concepts which are applied to the system are presented. One such concept involves the coupling of a linear programming water allocation model with a model simulating a specific river basin system. Analysis of operational policies regarding water regulation schedules is achieved by a simulation process which links the models of various water sources and water uses. Another model is a hydrologic model which simulates the effect of rainfall on the streamflows. A routing model which uses output from the hydrologic model provides information on discharges, water levels, and storage at different points in the system. A table is included which shows the present status of modeling activity in the flood control district. Fourteen models are tabulated with their type, field, and area of application. (Capehart-Florida)
W77-03524

6B. Evaluation Process

LOCAL WATER SYSTEMS ARE FREQUENTLY NEGLECTED.
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
J. C. Van Es, and R. J. Quigley.
Small Town, Vol 7, No 2, August 1976, p 4-6.
OWRT A-075-ILL(3), 14-31-0001-5013.

Descriptors: *Management, *Decision making, *Municipal water, Potable water, *Illinois, *Planning.
Identifiers: *Local planning.

On the basis of detailed questionnaires on municipal public drinking water systems given to 228 incorporated Illinois communities, the investigators concluded, among other things, (1) that the lines of communication among those responsible for water systems operations are frequently poor, (2) that financial information on a system's operation is often missing or unknown by those who set the rates, (3) that many municipalities (45%) do not engage in formal planning, and (4) that many systems (27%) have no procedures for such common emergencies as low water pressure. The investigators warn that unless local communities begin to take the initiative and eliminate these problems, unwanted federal and state intervention will become more and more necessary.
W77-03121

AN APPRAISAL OF CONFLICTING INSTITUTIONAL ATTITUDES ON THE WESTWIDE STUDY REPORT.

Idaho Univ., Moscow. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 346, Price codes: A06 in paper copy, A01 in microfiche. Proc. Paper No 308, June 1976, 108 p. Proc. of a Joint Water Resources Seminar of the Univ. of Idaho and Washington State Univ. (2nd Semester, 1975-1976). J.S. Gladwell, C.C. Warnick, W.H. Funk, J.R. Davidson, D.L. Bassett (eds.). OWRT A-999-IDA(8).

Descriptors: *Institutional conflicts, *Attitudes, *Conferences, Institutions, Water resources development, *Evaluation, Reviews, Research priorities.
Identifiers: *Westwide Study report, *Western US(Water problems), *Critical water problems(Western US).

'Critical Water Problems Facing the Eleven Western States' was the subject of this seminar. It is also the title of a final report authorized under PL 90-537 of 1968, sponsored by the U.S. Bureau of Reclamation, and otherwise known as the Westwide Study. (See W76-00716 and W76-00717) As had the USBR study, the seminar addressed con-

temporary water problems of the West, its format providing a broad pivotal base for speakers of varying state, local, regional or federal perspectives. (Gladwell-Idaho)
W77-03157

USER ORIENTED SYSTEMS ANALYSIS FOR REGIONAL MUNICIPAL WATER SUPPLY PLANNING.

Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 6A.
W77-03159

ELECTRIC POWER DEVELOPMENT IN THE PACIFIC NORTHWEST REGION: INSTITUTIONAL COMMITMENTS AND ALTERNATIVES, PHASE I.

Washington Univ., Seattle. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6E.
W77-03288

USE OF HYBRID COMPUTER MODEL IN RESOURCE PLANNING.

Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6A.
W77-03523

WATER MANAGEMENT AND REGULATION OF WATER USE.

Central and Southern Florida Flood Control District, West Palm Beach.
A. Kreitman.
In Depth Report, Vol 3, No 1, p 1-12, April 1975.
12 p. 5 fig., 2 tab.

Descriptors: *Florida, *Hydrologic budget, *Water allocation(Policy), *Water permits, *Groundwater resources, Water management(Applied), Consumptive use, Water districts, Evapotranspiration, Rainfall, Recharge, Potable water, Irrigation, Planning, Saline water intrusion, Water requirements, Water supply, Water conservation, Water utilization, Aquifers, Water sources.

The regulation of consumptive water use is one of the factors involved in water management. The flood control district of south Florida is engaged in formulating a plan to provide water resources to the many competing uses in a consistent manner. A water budget has been designed which establishes the long term sustained yield of the water basin. This safe yield is defined as the average annual recharge to the ground water system which is equivalent to the annual rainfall minus the annual evapotranspiration. Several examples of application of the water budget principle are given. One involves a request for an agricultural water use permit. The technique demonstrates that the amount of water requested substantially exceeded the amount actually needed. Therefore, a much smaller amount was permitted. Other studies relate to requests from municipalities for increases to the water supply systems. The possibility of salt water intrusion in the well field caused by additional wells was analyzed and it was recommended that different locations be used for the wells. (Capehart-Florida)
W77-03525

PROJECTIONS OF POPULATION, EMPLOYMENT, INCOME AND WATER USE FOR IOWA RIVER BASINS, 1975-2020.

Iowa Univ., Iowa City. Inst. of Economic Research.
For primary bibliographic entry see Field 6D.
W77-03542

THE LEGAL FRAMEWORK FOR PUBLIC PARTICIPATION IN CANADIAN WATER MANAGEMENT.

Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 6E.
W77-03543

THE OBJECTIVES, PART I OF THE STATE WATER PLAN, (IDAHO WATER RESOURCES BOARD).

Idaho Water Resource Board, Boise.
June 1974. 49 p. 5 fig., 2 tab.

Descriptors: *Idaho, *Comprehensive planning, *Water management(Applied), *State governments, Rocky Mountain region, Planning, Long-term planning, Water resources development, River basin development, Multiple-purpose projects, Social aspects, Legal aspects.
Identifiers: Snake River(Idaho).

An initial report identifies and defines the policies and objectives which the Idaho Water Resource Board has adopted to govern the planning, development and conservation of the state's water and related land resources. This report of objectives will constitute, along with subsequent individual reports covering projects and programs necessary for the state's three main river basin areas, the Idaho State Water Plan. Described in this report are interfaces among the state's natural resources as they relate to water use. These include land, water, geothermal water, minerals, timber, fish and wildlife. Other resource factors discussed are population, the economy, employment and personal income. Thirteen statements of objectives are delineated in the report, with each describing a facet of water planning philosophy that is intended to become mandatory for future governmental and private activities in the state which impact on water resources. Objective areas are: beneficial and efficient water use, electric energy, environmental quality, erosion and sedimentation control, fish and wildlife, aquaculture, flood damage reduction, agriculture, Indian lands and related water resources, interbasin water transfer, recreation, state-federal rights, and wild and scenic rivers. (Harris-Wisconsin)
W77-03544

WATER FOR NEVADA. WATER PLANNING REPORT.

Nevada Div. of Water Resources, Carson City. Office of State Engineer.
Special Summary Report, November 1974. 24 p.

Descriptors: *Nevada, *Comprehensive planning, *Water management(Applied), *State governments, *Reclamation states, Southwest U.S., Planning, Long-term planning, Water resources development, River basin development, Multiple-purpose projects, Social aspects, Legal aspects.
Identifiers: *Nevada State Water Plan.

Description is given of the information contained in detailed reports and supporting material which constitutes the state's comprehensive water plan. The legislative background and planning procedures of the overall effort are described, along with summaries of each of 16 'Water for Nevada' reports issued since January 1971, and reports of 'Alternative Plans for Water Use' covering six river basin areas into which the state is divided for water resource planning purposes. General findings, conclusions and recommendations are covered, along with separate conclusions and recommendations for the individual river basin areas. Conclusions and recommendations on projected water requirements are given for municipal and industrial water use, electric energy generation, mining, recreation, agriculture, fish and wildlife. The general conclusions and recommendations cover water law and administrative procedures, funding of water resource projects, local options and discretion, mining or depletion of

ground water, transbasin diversions, preferred uses, reservation of water quantities, termed approval of water appropriations, water supplies and rights for temporary construction uses, wells for domestic use, taxes on well production, geothermal resources, subdivision water supplies, state/federal jurisdiction, flood control, navigability, environmental considerations and continuing planning efforts. (Harris-Wisconsin)
W77-03545

IOWA'S WATER RESOURCES PROGRAM PROGRESS AND NEEDS.

Iowa Natural Resources Council, Des Moines.
Special Report 1973. 28 p. 15 fig., 1 tab.

Descriptors: *Iowa, *Planning, *Comprehensive planning, *Water resources development, Mississippi River Basin, Missouri River, Interstate rivers, State governments, State jurisdiction, River basin development, Water management (Applied), Institutions, Local governments, Non-structural alternatives, Water law, Water policy.

Identifiers: Upper Mississippi River Basin, Missouri River Basin.

A general program overview is described for developing a statewide plan for the orderly development, use, protection and conservation of water and related resources in Iowa. Included are summations of facts justifying a comprehensive water plan, and a general description of the state's available water resources—including discussions of climatological factors, streamflow, floods, groundwater, geologic and hydrologic considerations, and general water quality characteristics of the state. Interrelationships are examined for water supply, water quality control, agricultural crop production, flood plain occupancy and management, water-oriented recreation, fish and wildlife resources, navigation and energy production. Historical aspects of water policy development in Iowa are summarized, and the state's interface with Missouri and Upper Mississippi inter-state river basins is examined. An organizational and institutional flow chart is given in which the dynamics of water and related resources planning are graphically described. Findings and recommendations are listed for studies of existing state water policies and laws, public participation aspects, urban versus rural water supply needs, wastewater treatment, watershed problem identification and ranking, and program funding on multi-governmental levels. (Harris-Wisconsin)
W77-03547

URBAN WATER USE IN CALIFORNIA.

California State Dept. of Water Resources, Sacramento.
Bulletin No. 166-2, October 1975. 178 p., 5 fig., 6 tab.

Descriptors: *California, *Water utilization, *Cities, Surveys, Data collections, Prices, Planning, Urbanization, *City planning.

Monthly water use data for 147 water service agencies throughout California for the period between 1961 and 1970 is presented. Analysis of the data indicates that, in 1970, California urban residents and manufacturing industries together used an average of 4.3 billion gallons of fresh water per day or about 13% of the total freshwater use. Variations in unit water use among the 11 hydrologic study areas along with the magnitude of self-supplied water use in some areas are illustrated. Unit use is exceptionally high in the North Coastal and North Lahontan areas due to a small population base and high industrial water use. Annual water use by county is illustrated as are county monthly and annual unit water use for 1966 through 1970, except for industry-produced water which was ascertained only on an annual basis. A summary of annual per capita water use within individual cities and agency boundaries is included,

as well as the average retail price range for water in 1970. The basic records of monthly unit water use for 1960 through 1970, which provide the main statistical array of data to use in making peak monthly demand projections is also included. Most of this data is graphic or in statistical form. (Luedtke-Wisconsin)
W77-03549

PLAN FOR IMPROVEMENT OF THE DELTA LEVEES.

California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 4A.
W77-03550

THE CALIFORNIA STATE WATER PROJECT IN 1975.

California State Dept. of Water Resources, Sacramento.
Bulletin No. 132-75, June 1975. 192 p., 17 fig., 12 tab., append.

Descriptors: *Facilities, Hydraulic structures, *Water management (Applied), *Water resources development, *Water distribution (Applied), *Multiple-purpose projects, *California, Dams, Impoundments, *Aqueducts, Water conveyance, Pumping plants, Hydroelectric plants, Powerplants, Long-term planning, Legal aspects, Financing, Recreation, Construction, Administration.
Identifiers: California Aqueduct.

The progress to 1975, current status and future plans of California's Water Project, including the 444-mile aqueduct, are summarized and reviewed, with specific reference made to construction of dams and reservoirs, power plants, supplemental aqueducts and pumping stations. Information is provided concerning the history of the project, project construction, project utility management, operations, visitor use, recreation/fish/wildlife use and project financing. Seventy-six percent of the project facilities scheduled for completion by the end of 1985 were under construction or completed by the beginning of 1975. These facilities include 23 dams and reservoirs, eight power plants, 22 pumping stations and 684 miles of aqueducts. Detailed information is given for actions concerning project power, water supplies, recreation/fish/wildlife enhancement; litigation; construction plans, specifications, land acquisition, relocations and building progress; management of water rights, water contracts and power contracts; project operations among the various field divisions; construction expenditures and other capital requirements; operating revenues; miscellaneous receipts and capital requirements. (Harris-Wisconsin)
W77-03551

HYDROLOGIC INVENTORY OF THE SAN RAFAEL STUDY UNIT.

Utah Div. of Water Resources, Salt Lake City.
For primary bibliographic entry see Field 4A.
W77-03552

MEETING WATER DEMANDS IN SACRAMENTO COUNTY.

California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6D.
W77-03553

VEGETATIVE WATER USE IN CALIFORNIA, 1974.

California State Dept. of Water Resources, Sacramento. Water Use Programs.
For primary bibliographic entry see Field 3F.
W77-03554

INVESTIGATION OF THE PHYSICAL FEASIBILITY OF MOBILE FISH PROCESSING PLANTS.

Fisheries and Marine Service, Ottawa (Ontario). Research and Development Directorate.
W. L. Dilk.
Technical Report No. 634, 1976. 29 p., 12 fig., 1 append.

Descriptors: *Canneries, Fish handling facilities, *Economic justification, Fish harvest, Commercial fish, Commercial fishing, Food processing industries, Pollutants, Industrial wastes, Facilities, Capital costs, Cost analysis, Estimated costs, Canada, Economies of scale, Waste disposal.
Identifiers: *Mobile facilities, Bio-drum liquid effluent disposable system, Mobile processing units.

A study in Canada to determine the physical feasibility of building mobile fish processing plants indicates that systems made up of three mobile sub-units each can be utilized for defleshing, block freezing operations, cold storage, power supply and optional liquid effluent disposal. However, further studies are needed to relate economic feasibility of the units to their 10 year life expectancy, along with analysis of production constraints, capital costs and space limitations inside the units. The mobile fish processing concept is designed as a partial answer to quota systems applied to certain lakes that constrain development of permanent facilities, and as a solution to the problem of underutilized species such as mullet which are harvested on a seasonal basis. Detailed technical data are given for plant specifications such as mechanical and electrical systems, refrigeration, process equipment and product transportation. Logistics and production capabilities are described, and capital costs are compared with capital reduction options made possible by deletion of certain equipment items or by use of partial leasing arrangements. General production parameters and considerations, along with physical plant capacities, are summarized. (Harris-Wisconsin)
W77-03558

THE STATE OF UTAH WATER - 1975.

Utah Div. of Water Resources, Salt Lake City.
B. C. Saunder.
January 1976. 72 p., 9 fig., 2 tab., 10 ref.

Descriptors: *Utah, *Comprehensive planning, *Decision making, *Water allocation (Policy), Projections, Colorado River Basin, Colorado River, Water demand, Water rights, Competing uses, Electric power production, Cooling water, Irrigation, Industries, Financing, Oil shales, Water resources development, Cloud seeding, Consumptive use, Water supply.
Identifiers: *Utah water plan.

This third general status report on the comprehensive water planning process in Utah addresses the current issues and the water planning process itself. The major water resources planning problem in this water-deficient state is one of economics, that is, projects which are technically and physically feasible are often beyond the means of the potential users to pay the costs. The emphasis is directed toward determining and placing in priority the most pressing water-related needs and taking appropriate action to meet those needs. The major water policy issues facing state planners are goals and objectives, water allocation, and the use of the Colorado River water as related to socio-economic values and environmental concerns. The guiding principle of the planning process is directed toward optimum use of water resources by including concepts of multiple use of facilities, sequential water use and reuse. Among the water allocation considerations are the requirements for coal mining, coal-fired power plants, oil shale development, and financing. About 47% of the state has been cloud seeded and it is anticipated that the major mountain watersheds will be seeded within the next few years. Water derived from cloud

Field 6—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

seeding is regulated by existing water rights. Cloud seeding is considered an integral part of the state water plan and may be the only method to provide an additional water supply in areas where economic restrictions prohibit physical conveyance systems to be built. (Auen-Wisconsin) W77-03559

IOWA WATER RESOURCES FRAMEWORK STUDY PLAN OF STUDY.

Iowa Natural Resources Council, Des Moines. Technical Coordinating Committee. August 1975. 26 p, 3 fig, 4 tab.

Descriptors: *Water management (Applied), *Iowa, *Planning, *Water resources development, Comprehensive planning, State governments, State jurisdiction, River basin development, Institutions, Local governments, Non-structural alternatives, Water law, Water policy, Programs, Methodology, Projections, Scheduling, Budgeting, Social aspects.

Identifiers: Citizen participation, Public information, Problem identification and ranking.

Iowa's comprehensive state water resources plan is outlined, including a statement of goals and objectives, description of the study area, and framework descriptions of the study organization and management, strategies for public participation and information, and initial ideas for the process, scheduling and budget of the plan. The framework study, based on existing data, is the first part of the state's long-range water resources planning process. The study identifies needs, along with existing and potential problems, outlines current and potential demands on the resources, suggests programs and remedial measures and suggests policies from which fundamental philosophy of water resources management and allocation will be derived for use by the appropriate state agencies. Time-table activities under the plan are scheduled from July 1975 through June 1978 for the framework study. Work assignments are made for individual segments of the study work effort: data base and needs, water resources availability, socioeconomic/legal/institutional trends, water use, water quality management, water-oriented fish and wildlife resources, energy production and navigation. (Harris-Wisconsin) W77-03561

REHABILITATION OF PAMLICO SOUND OYSTER PRODUCING GROUNDS DAMAGED OR DESTROYED BY HURRICANE GINGER.

North Carolina Div. of Marine Fisheries, Raleigh. F. H. Menden. Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 966. Price codes: A03 in paper copy, A01 in microfiche. Special Scientific Report No 27, May 1975. 36 p, 19 fig, 3 tab, 7 ref. NMFS 2-173-D.

Descriptors: *Oysters, *North Carolina, Shellfish farming, Hurricanes, Rehabilitation. Identifiers: *Pamlico Sound (NC), Oyster beds.

The North Carolina Pamlico Sound oyster beds, damaged by Hurricane Ginger in 1971, were rehabilitated to prevent losses to more than 700 fishermen. The focus was to reseed shell stock and/or marl to compensate for the mortality of small oysters and to reestablish base rocks in these traditionally high quality grounds. Oyster rehabilitation began in June 1972 with plantings of 69,000 bushels of fresh oyster shells as cultch and 86,000 bushels of marl, using a formula of 500 to 750 bushels per acre, with the higher planting rates in deeper water. Sampling of spat set after six months indicated good winter survival and normal to excellent growth in the southern Pamlico Sound areas but lower spat sets in the northwest areas. Approximately 24,000 bushels of seed oysters were planted in the less productive areas in 1973, employing local and commercial fishermen. All

shell plantings showed successful rehabilitation. Marl spat set was more irregular with lower winter survival than on shell. Seed oysters were procured as additional cultch material and stock from near the entrance to Pamlico River where they seldom grew to legal harvestable size. It was believed that oyster growth there was retarded by the large amount of fresh water runoff. (Auen-Wisconsin) W77-03562

HURDLES IN THE PATH OF COASTAL PLAN IMPLEMENTATION.

G. Bowden. S. Cal. L. Rev., Vol. 49, No. 4, p. 759-71 (1976). 13 p.

Descriptors: *California, *Comprehensive planning, *Political aspects, *Governmental interrelations, Regional development, Non-structural alternatives, Economic efficiency, Water resources development, Local governments, Regulation, State governments, Planning, Multiple-purpose projects, Legislation, Decision making.

Identifiers: Coastal waters, Coastal zone management.

The article considers three impediments to implementation of the California Coastal Plan: the plan's broad scope; problems with clarity of wording; and reliance on local governments for execution. Unusual provisions for coastal zoning and controversial changes in tax structure may undermine public support for the plan and block its legislative passage. In addition, it is not clear that the technical knowledge necessary to implement the plan's goals exists. Some economic-cost criticism has been directed at the plan, but it is not totally justified. Ambiguity of terms is a problem for the plan; and the currently proposed implementing statute does not alleviate this problem. There may be some difficulty with local government implementation since local entities played no role in policy-formation for the plan. Furthermore, the plan does not provide a blueprint for a system of arbitrating conflicts between state and local officials; some provision must be made to facilitate consultation and cooperation. Thus, legislative revision aimed at a solution for intergovernmental conflict, and focusing on key issues of the plan would increase its chances for passage. (Molloy-Florida) W77-03582

CALIFORNIA WATER PROJECT: LAW AND POLITICS.

California Univ., Berkeley. Dept. of Economics. For primary bibliographic entry see Field 6E. W77-03583

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A COMPUTER PROGRAM FOR ESTIMATING COSTS OF OWNING AND OPERATING AN IRRIGATION WELL UNDER CONDITIONS OF DECLINING WATER LEVELS.

Washington State Univ., Pullman. Dept. of Agricultural Economics. M. Feldman, and N. K. Whittlesey. Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 398. Price codes: A04 in paper copy, A01 in microfiche. August 1976. 65 p, 1 fig, 4 tab, append. OWRT B-051-WASH(1). 14-31-0001-3945.

Descriptors: *Groundwater, *Conjunctive use, *Computer programs, *Estimating costs, *Irrigation wells, Water levels, Costs, *Washington, Model studies, Pumping, Withdrawal, Investment.

A computer program for calculating cost per acre-foot of groundwater under a wide range of

specified conditions is described. The existing model applies to conditions found in Adams, Lincoln, and Grant Counties of eastern Washington. The cost calculations are based on 1973 prices. By supplying other prices, tax rates, and power costs, the model could be generalized to other times and places. The model does not consider the effects of federal income taxes on the real costs of the well investment. The well conditions specified in the model include rate of decline of static water level (SWL), capacity, surface head required, months in pumping season, aquifer transmissivity, interest rate on invested capital, and permitted decline interval for pump replacement. The model determines what well and pump equipment will be required initially and at replacement intervals. The initial purchase cost, and real owning and operating costs, are displayed each time new equipment is required. The model calculates costs as if production were to cease each time new equipment is required. The new equipment is added and the model then estimates the marginal costs of continuing to operate. Per acre-foot costs are discounted at various interest rates to obtain their present value. W77-03211

RESIDUAL WASTE MANAGEMENT RESEARCH AND PLANNING PROJECTS, SEPTEMBER 1975.

Environmental Protection Agency, Washington, D. C. Water Planning Div. For primary bibliographic entry see Field 5B. W77-03355

6D. Water Demand

WATER RESOURCES OF AUSTRALIA AND THE PATTERN OF POPULATION CONCENTRATIONS.

J. W. Holmes. National Population Enquiry Research Report No. 4. Australian Government Publishing Service, Canberra, 1976. 24 p., 2 fig., 15 tab.

Descriptors: *Human populations, *Distribution patterns, *Water requirements, *Water resources, *City planning, *Australia, Water supply, Water quality, Data collections, Urbanization, Consumptive use, Water utilization.

Identifiers: Albury-Wodonga (NSW-Vic), Monarto (SA), Dampier (WA).

Determination of the urban population which can be supported by the water supplies of a given region involves not only the total consumptive use of water, but also the initial quality of the water supply, the possibility of reusing treated effluent, and the need for a minimum dilution flow to keep pollution of downstream waters by effluent within acceptable limits. Available data on all these factors for current Australian urban centres are collected and reviewed to derive quantitative principles for the planning of future population centres. These principles are then applied in detail to three presently-proposed urban growth centres; and in a general way to derive a maximum-permissible population map of Australia, based on drainage divisions. The conclusion reached is that Australia's water resources could support a potential maximum population of about 280 million. (CSIRO) W77-03278

PLAN OF STUDY OF THE HYDROLOGY OF THE MADISON LIMESTONE AND ASSOCIATED ROCKS IN PARTS OF MONTANA, NEBRASKA, NORTH DAKOTA, SOUTH DAKOTA, AND WYOMING.

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 4B. W77-03338

PROJECTIONS OF POPULATION, EMPLOYMENT, INCOME AND WATER USE FOR IOWA RIVER BASINS, 1975-2020,

Iowa Univ., Iowa City. Inst. of Economic Research.

J. R. Barnard, and W. T. Dent.

May 1976. 229 p. 4 fig., 101 tab., 28 ref., 3 append.

Descriptors: *Iowa, *Projections, *Water demand, Forecasting, Decision making, Planning, Estimating, Water utilization, Population, Economic prediction, Employment, Income, Industrial water.

Identifiers: Demography.

An extensive set of demographic, economic, and water use projections for Iowa from 1975 to the year 2020 are reported. Past historical trends in the state economy at the county level were analyzed and then synthesized with a set of national projections for multi-county sub-national nodal economic areas of the United States which were centered on major urban economic areas, in order to develop the Iowa projection series. Results indicate that the population will grow at the rate of 0.24%/year from 1975 to 2020, increasing from 2,887,000 to 3,217,000. Employment will increase at about double the rate of population with most of this increase in labor force participation coming from an increasing number of women seeking employment. An increase in productivity per worker will yield a 2.71%/year increase in real per capita income. Development of water use estimates involved consideration of water intake, gross use, discharge, and consumption. Water use was fused to the state input-output model and the concepts of interindustry water relationships and water multipliers were also introduced. Iowa's water intake requirements are expected to increase at the rate of 4.6%/year, with the electric utility, manufacturing, agricultural and residential sectors expected to remain the heaviest users. (Luedtke-Wisconsin) W77-03542

URBAN WATER USE IN CALIFORNIA.

California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 6B.

W77-03549

MEETING WATER DEMANDS IN SACRAMENTO COUNTY.

California State Dept. of Water Resources, Sacramento.

Bulletin No. 104-11, June 1975. 98 p., 28 fig., 16 tab., 26 ref.

Descriptors: *Water demand, *Surface-groundwater relationships, *Conjunctive use, *Water management (Applied), *Water allocation (Policy), Population, Groundwater availability, Groundwater resources, Water supply, Water table, California, Optimum development plans, Planning, Long-term planning, Water users, Water conservation, Land use, Projections, Forecasting, Water resources development, Model studies, Mathematical models, Legal aspects, Social aspects, Evaluation, Institutions.

Identifiers: *Sacramento County (Calif), Demography.

Although Sacramento County, California will have more water than it needs for the sum of all anticipated uses from the present time until 2020, actual supplies available to individual water purveyors will not be proportional to specific projected demands, and concomitant shortages and abundances may be expected. At present, about half the county's water supply comes from the ground water basin, levels of which have been cumulatively lowered since 1940. In a review of demand data, future population, land use and water requirements are projected for 45 years. Using the projected data and a mathematical model of the ground water basin, five examples of operational management plans are simulated—ranging from

100% ground water pumpage to a maximum possible use of surface water. The results indicate that a stable ground water basin can be achieved by use of approximately 58 to 60% surface water. Recommendations call for specific plans to implement the movement of additional water supplies to areas of need, to increase surface water use to save ground water supplies, and to replenish the ground water level by making certain institutional changes impacting on water use in the county. The plan would involve cooperative action between the county government and local water purveyors. (Harris-Wisconsin) W77-03553

THE STATE OF UTAH WATER - 1975,

Utah Div. of Water Resources, Salt Lake City.

For primary bibliographic entry see Field 6B.

W77-03559

THE STATE OF UTAH WATER.

Utah Div. of Water Resources, Salt Lake City.

September 1972. 20 p.

Descriptors: *Water resources development, *Utah, *Water allocation (Policy), *Future planning (Projected), Water utilization, Inter-basin transfers, Groundwater resources, Hydrology.

The current status of Utah's water resources is summarized and the inherent choices available to meet desired industrial and municipal growth, stabilization of existing rural communities, preserving and/or enhancing recreation and wildlife areas, and creating an institutional and management structure that will encourage effective water allocation and use are generalized. It is estimated that there is 2.5 million acre-feet of surface water available for new uses, 400,000 acre-feet of groundwater, and a 1.5 million acre-feet annually for 50 years of relic water stored in underground reservoirs. Present and future (2020) water use by hydrologic area are computed and alternatives such as inter-basin transfers and desalination are considered, as are potentials for local hydrologic development. The greatest impacts on the state's water resources are water allocation and financing for which the present legislation gives few guidelines. And because the legislation is based on the precept that the state should assist any legitimate water development, its validity is inapplicable to the projected water demand. To allow officials to make defendable choices among potential competing users, at an acceptable cost, comprehensive legislative guidelines are required. (Auen-Wisconsin) W77-03560

WATER RIGHTS,

Wisconsin Univ., Madison.

For primary bibliographic entry see Field 6E.

W77-03599

6E. Water Law and Institutions**AN APPRAISAL OF CONFLICTING INSTITUTIONAL ATTITUDES ON THE WESTWIDE STUDY REPORT.**

Idaho Univ., Moscow. Water Resources Research Inst.

For primary bibliographic entry see Field 6B.

W77-03157

ELECTRIC POWER DEVELOPMENT IN THE PACIFIC NORTHWEST REGION: INSTITUTIONAL COMMITMENTS AND ALTERNATIVES, PHASE I,

Washington Univ., Seattle. Inst. for Environmental Studies.

K. N. Lee, M. E. Marts, R. G. Walton, and A. D. Birmingham.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 382. Price codes: A08 in paper copy, A01 in microfiche. Interim Report, September 1, 1976. 166 p., 3 fig., 1 tab., 2 append. OWR T A-080-WASH(1). 14-34-0001-6050.

Descriptors: *Water policy, *Public rights, *Electric power, Energy, *Pacific northwest (US), Water resource development, Legal aspects, *Institutions, *Alternative planning, *Electric power production.

Pacific Northwest regional electric power development has been studied with three objectives: (1) to assemble an historical account of institutional arrangements for electric power development in the region; (2) to identify emergent public policy issues; (3) to identify long-range institutional research problems relevant to regional energy and resource development. The historical path of electric power development, stemming from the 1937 Bonneville Project Act, importantly shapes the institutional framework in which the growth of a combined hydroelectric and thermal generating system of regional scale is to be planned, financed, and implemented. The choices have fundamental, long-term -- and yet not publicly visible -- implications for the economic, environmental, and political future of the region. Some developing mechanisms for articulating the political choices -- and controversy -- are evaluated and compared with alternatives. W77-03288

NATIONAL SAFE DRINKING WATER STRATEGY, ONE STEP AT A TIME.

Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.

For primary bibliographic entry see Field 5G.

W77-03357

GREAT LAKES WATER QUALITY; FOURTH ANNUAL REPORT TO THE INTERNATIONAL JOINT COMMISSION.

International Joint Commission-United States and Canada. Great Lakes Water Quality Board.

For primary bibliographic entry see Field 5G.

W77-03383

COLORADO WATER QUALITY CONTROL ACT.

Colo Rev Stat Ann secs 25-8-101 thru 25-8-704 (1973).

Descriptors: *Adoption of practices, *Colorado, *Water quality, *Water pollution control, *Permits, Water law, Water treatment, Pollution, Water pollution treatment, State governments, Water quality control, Water quality standards, Sampling, Water pollution sources, Legal aspects, Legal review.

To preserve the quality of state waters, the Colorado legislature has established a water quality control commission authorized to promulgate and enforce water quality standards. The commission is also authorized to issue waste discharge permits, classify state waters, review applications for underground discharges and review local governmental regulations for individual sewage disposal systems. Sampling, monitoring, recording and reporting shall be done in an effort to detect and remedy water pollution. Authority is granted to enter, in a reasonable time and manner, all lands for investigation of sources of water pollution, as well as to conduct research studies with respect to water pollution. All regulations, standards and decisions shall be subject to judicial review. Regulations for permits are established, and the commission is given the power to construct all necessary pollution facilities. Penalties for violation of these regulations are delineated. (Frank-Florida) W77-03490

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

INDIVIDUAL SEWAGE DISPOSAL SYSTEM ACT.

Colo Rev Stat Ann secs 25-10-101 thru 25-10-112 (1973).

Descriptors: *Colorado, *Sewage treatment, *Sewage disposal, *Regulation, Legislation, Standards, Administrative agencies, Local governments, Permits, Penalties(Legal), Law enforcement, Septic tanks, Inspection, Treatment facilities, Installation, Maintenance, Performances, Percolation, Design criteria, Building codes, Effluents, Evapotranspiration.

The Colorado state board of health is required to adopt guidelines providing minimum standards for the regulation of individual sewage disposal systems. Local boards of health must adopt guidelines for their areas of jurisdiction which comply with the state guidelines. Such guidelines must cover all aspects of performance, location, construction, alteration, installation and use of individual sewage disposal systems. Rules must be adopted governing procedures for the application for and issuance of permits, the inspection, testing and supervision of installed systems, the issuance of cease and desist orders, the maintenance and cleaning of systems, and waste disposal. Local boards may require licensing of systems contractors and systems cleaners. The primary responsibility for enforcement of the regulations is placed on the local agencies. (Capehart-Florida)

W77-03491

FLOATING TIMBER ON STREAMS.

Colo Rev Stat Ann secs 36-8-101 thru 36-8-110 (1973).

Descriptors: *Colorado, *Lumber, *Lumbering, *Permits, Rivers, Streams, Appropriation, State governments, Legislation, Legal aspects, Licenses, Administrative agencies, Administrative decisions, Water law, Water use.

Colorado has enacted legislation providing that all state streams can be used for floating logs or timber subject to prior rights of appropriation. A permit must be obtained from the state engineer, however, stating the location of the stream, as well as the booms or structures of all appropriators on the stream. Thirty days after filing, a hearing is held where concerned parties may object. The state engineer may modify or deny a permit if the work will cause damage to existing structures. In addition, the applicant shall post a security bond, but approval by the state engineer does not relieve him from liability for damage. Finally, objections to the hearing result may and should be taken to the district court in the county where the logging is to take place. (Frank-Florida)

W77-03492

SPECIFIC GRANTS OF POWER (CONDEMNATION AND RIGHTS-OF-WAY).

Colo Rev Stat Ann secs 38-2-101 thru 38-2-103 (1973).

Descriptors: *Colorado, *Eminent domain, *Right-of-way, *Facilities, Legislation, Condemnation, Land tenure, Adjacent property owners, Easements, Drainage systems, Legal aspects, Transportation utilities, Water storage, Surface runoffs, Ditches, Roads, Tunnels, Surveys, Appropriation, Bridges, Reservoirs, Pipelines, Railroads.

The state of Colorado has enacted specific grants of power. The power of eminent domain is granted to any corporation to acquire property, rights of way, or easements as needed to construct facilities associated with transportation, public utilities, and water conveyance and storage. Any ditch, reservoir, or pipeline company may acquire by condemnation the right to use unappropriated water. The authority to enter lands for the purpose of surveys is given to corporations constructing roads,

ditches, tunnels, or railroads. The power of eminent domain is granted to private landowners to allow construction of a drain for surplus water across the land of another in order to reach a natural waterway. (Capehart-Florida)

W77-03493

RIGHTS TO WATER.

Ariz. Rev. Stat. Ann. secs 45-171 thru 45-175 (1956), as amended, (Supp. 1975).

Descriptors: *Arizona, *Water users, *Water rights, *Prior appropriation, Relative rights, Competing uses, Water allocation(Policy), Administrative agencies, Irrigation, Water conveyance, Channels, Water delivery, Water districts, Water distribution(Applied), Water law, State jurisdiction.

Identifiers: *Water rights(Non-riparian).

Use of water may be severed from land without losing priority already established unless the right is for irrigation usage. Consent of the owner and agency approval are required, however, for transfers of water rights. Transfers cannot be made between irrigation districts and transfers within such districts require district approval. Transfers cannot enlarge rights to use. Natural channels of streams may be used to transport waters, even though channel waters have been appropriated, if such transport does not diminish the use which has been appropriated. In event of dispute in water transport cases, district superintendents will decide the issue. If use of watercourses for carrying water is desired by a reservoir owner, the owner must notify the district supervisor who will insure that the water reaches its proper designation. With regard to use of water for irrigation purposes, land owners are preferred in times of scarcity according to appropriation dates. Vested rights to water use, relative priorities to use, rights judicially determined and rights to acquire property by eminent domain remain unimpaired by this statute. In addition, rights acquired under prior laws remain in effect provided the use of the rights is current. (Comer-Florida)

W77-03494

WATER POLLUTION.

Ariz Rev Stat Ann secs 36-1851 thru 36-1870 (1974), as amended, (Supp. 1975).

Descriptors: *Arizona, *Administrative agencies, *Pollution abatement, *Water quality standards, Regulations, Water quality control, Water pollution control, Legislation, Permits, Sediments discharge, Effluents, Public health, Environmental sanitation, Planning, State jurisdiction, Administrative discussions.

Pursuant to statute, the water quality council, a subdivision of the department of Health Services, is given responsibility for water pollution control. The department is given general duties of administration of rules and regulations, administration of grants and loans, development of control and abatement policies and liaison duties. The council is required to develop a comprehensive water quality program and to adopt and promulgate rules and regulation to implement the program. Standards may be adopted and altered to regulate water quality. Public hearings are required before standard adoption or amendment. In conjunction with the policy of this act, water pollution and reducing water quality below standards are prohibited and a permit is required to construct or alter any disposal system or to increase or cause increase in waste discharge. Violation charges may be administratively decided and corrective action ordered. The department shall have the power to inspect. Injunction and criminal charges are available as means of prevention of pollution. These statutory penalties are in addition to any common law remedies. (Comer-Florida)

W77-03495

PROVIDENCE AND WORCESTER COMPANY V. EXXON CORPORATION (RIGHT-OF-WAY IN LAND SUBMERGED IN TIDEWATER).

359 A2d 329-44 (RI 1976). 16 p, 2 append.

Descriptors: *Rhode Island, *Navigable waters, *Piers, *Right-of-way, Legal aspects, Judicial decisions, Boundary disputes, Easements, Jurisdiction, Real property, Contracts, Negotiations, Ships, Transportation, Boats, Navigation, Harbors, Bodies of water.

Plaintiffs sought adjudication of their rights in a pier extending into Providence harbor. To that end, plaintiffs brought two actions: the first prayed for a mandatory injunction ordering defendants to remove certain obstructions from a right-of-way and permanently enjoining defendants from obstructing the way; the second prayed for declaratory judgment as to the rights, status, and other legal relations of the parties in connection with the pier and adjoining land. The Supreme Court of Rhode Island held that the trial justice erred in ordering defendants to execute conveyance of the pier in fee simple to plaintiffs, that pier owner or its successors were not required to demolish existing pier and build a new one in order to enjoy their rights as reserved under a 1941 deed, that a 40-foot wide right-of-way was meant to serve adjoining lands as well as the pier itself. (Cowart-Florida)

W77-03496

CARLSON V VILLAGE OF WORTH (PREEMPTION OF LOCAL REGULATION OF SANITARY LANDFILL BY ENVIRONMENTAL PROTECTION ACT).

343 NE2d 493-504 (111 1975). 11 p.

Descriptors: *Illinois, *Landfills, *Permits, *Cities, *Environmental sanitation, Administrative agencies, State governments, Environmental control, Regulation, Standards, Judicial decisions, Legal aspects, Jurisdiction, Legislation, Political aspects, Zoning, Sites.

Identifiers: *Administrative regulations, Injunctive relief, Licenses.

Plaintiff landowner brought suit to have defendant municipality's ordinance for licensing and regulating sanitary landfills declared invalid. The plaintiff had obtained a permit from the state environmental protection agency authorizing him to install and operate a sanitary landfill. Subsequently, the municipality enacted an ordinance requiring a municipal permit and compliance with municipal standards. The plaintiff contended that the state environmental protection act preempted the local ordinance. The defendant contended that since the state permit required compliance with local laws, the ordinance was valid. The trial court declared the ordinance invalid and the Supreme Court of Illinois affirmed, saying that the state environmental control act is intended to provide a unified statewide program, and thus preempts local law. In a supplemental opinion denying rehearing, the court stated that procedures available to the state agency are sufficient to set standards for locating landfills. Strong dissenting opinions maintained that the decision vests more authority in the agency than was intended by the legislature. The dissents felt that state and local governments should be allowed to legislate concurrently on environmental matters. (Capehart-Florida)

W77-03497

STATE DEPT OF POLLUTION CONTROL V INTERNATIONAL PAPER CO. (DETERMINATION OF FISH VALUE THAT WERE KILLED BY POLLUTANTS).

329 So2d 5-9 (Fla 1976). 5 p.

Descriptors: *Legal review, *Florida, *Damages, *Fishkill, Oxygen sag, Biochemical oxygen demand, Oxygen requirements, Administrative agencies, Administrative decisions, Judicial decisions.

Penalties(Legal), Law enforcement, Legislation, Constitutional law, Regulation, Water law, Water pollution sources, Water pollution effects, Legal aspects.
 Identifiers: *Presumptions(Legal), Hazardous substances.

Plaintiff Department of Pollution Control filed suit for enforcement of an administrative decision that defendant paper company had caused a fishkill with resulting damages. The trial court dismissed, finding the statute governing determination of damages to be unconstitutionally vague. The Supreme Court of Florida, on appeal, affirmed dismissal on the grounds that the amendment authorizing the department to administratively determine liability and damages and to seek court enforcement of the administrative order could not be retroactively applied. At the time of the offense, the agency alternatives were either to decide the issues and wait for voluntary compliance or to seek independent judicial determination of liability and damages. Adoption of the amendment after the offense but before procedural action affected substantive rights and retroactive application was, therefore, not allowable. Furthermore, the basis of damages determination was not unconstitutionally vague because no conclusive effect was given the statutory formula. A rebuttable presumption arose from use of the statutory formula, but competent contrary evidence reduced any presumption of damage amounts to mere evidence. (Comer-Florida)
 W77-03498

WATER RIGHTS AND LIENS.

Wyo Stat Ann secs 36-114 thru 36-115 (Supp 1971).

Descriptors: *Wyoming, *Water rights, *Real property, *Legislation, Land tenure, Appropriation, Federal government, State governments, Compensation, Contracts, Irrigation, Taxes, Leases, Legal aspects, Water law, Water contracts, Payment, Financing, Parks.
 Identifiers: *Liens.

Water rights to all lands acquired under the provisions of this act become appurtenant to the land when title passes from the United States to the state. Any entity that furnishes water for a given tract of land shall have a first and prior lien on the water right and on the land itself for all deferred payments for the water right. This lien takes preference over any other lien created by the land owner and it remains in force until the final deferred water right payment is made. (Capehart-Florida)
 W77-03499

POISONING OF, AND OBSTRUCTION TO, FISH.

Wyo Stat Ann secs 23-115 thru 23-116 (Supp 1971).

Descriptors: *Wyoming, *Fish, *Poisons, *Barriers, Legislation, Fish management, Fish passages, Fish conservation, Fish ladders, Dams, Structures, Toxins, Chemicals, Rivers, Streams, Creeks, Lakes, Ponds, Nets, State jurisdiction, Administrative agencies, Water law, Water policy.

Wyoming prohibits persons from using any poison or deleterious drug in any of the waters of the state for the purpose of catching, killing or destroying fish. This prohibition shall not prevent manufacturing or industrial works from operating near any natural stream or lake providing they build a dam which keeps any tailings, saw-dust, chemicals or other refuse, deleterious or poisonous substances from passing into the stream or lake. It is also unlawful to place across any rivers, creeks, ponds or lakes any net, trot-line or any other obstruction which prevents the free passage of fish without the consent of the fish warden. Furthermore, the fish warden may arrange for fish ways or ladders to be erected where they are necessary. (Cowart-Florida)
 W77-03500

DITCH COMPANIES.

Wyo Stat Ann secs 17-188 thru 17-193 (Supp 1971).

Descriptors: *Wyoming, *Ditches, *State governments, *Water rights, *Irrigation ditches, Channels, Canals, Conduits, Water conveyance, Trenches, Land, Irrigable land, Water management(Applied), Mills, Mining, Flumes, Structures, Conveyance structures, Water law, Banks.

Ditch companies may be formed in the state of Wyoming by three or more persons who associate for the purpose of constructing ditches which will convey water to mines, mills, or lands. Such persons shall state in their certificate the streams from which the water is to be taken, the line of said ditches, and the use to which said water is to be applied. Ditch companies formed under this article shall have the right of way over the lines named in the certificate. The companies shall be required to keep the banks of their ditches in good condition so that water shall not escape. The companies shall be authorized to mortgage or execute deeds of trust to secure money for the operation of their water works or ditches. Provisions are also set forth for flume companies. (Cowart-Florida)
 W77-03501

IRRIGATION AND WATER RIGHTS.

Wyo Const art 8 secs, 1 thru 5.

Descriptors: *Wyoming, *Water rights, *Water distribution(Applied), *Administrative agencies, Legislation, Administration, Water management(Applied), Bodies of water, Lakes, Streams, Natural streams, Springs, State governments, Jurisdiction, Prior appropriation, Regulation, Water allocation(Policy), Beneficial use, Preferences(Water rights), Priorities, Distribution, Diversion, Water law.

The water of all natural streams, springs, lakes or other collections of still water within the boundaries of the state of Wyoming is state property. A board of control shall be established to supervise the appropriation, distribution, and diversion of these waters. Appropriation for beneficial uses shall have priority, but no appropriation shall be denied except when it is demanded by the public interests. In addition, the governor shall appoint a state engineer to preside over the board of control, and to supervise the waters of the state. To aid in this supervision, the legislature shall divide the state into water divisions. (Cowart-Florida)
 W77-03502

CONTROL OF WATER AND EMINENT DOMAIN.

Wyo Const art 1, sec 31 thru 32.

Descriptors: *Wyoming, *Water control, *Eminent domain, *Water allocation(Policy), Water distribution(Applied), Water supply, Water demand, Competing uses, Industries, State governments, Industrial water, Channels, Priorities, Reservoirs, Ditches, Drains, Flumes, Compensation, Diversion, Relative rights, Water management(Applied), Agriculture, Mining, Sanitary engineering.

Water is essential to industrial prosperity. Although the water supply in Wyoming is limited, it is capable of being diverted from its natural channels. The control over the water supply should therefore be in the state which shall guard equally all the interests involved. As to eminent domain, private property shall not be taken for private use without the consent of the owner, except for: private ways of necessity and reservoirs, drains, flumes, ditches on or across the lands of others for agricultural, mining, milling, domestic or sanitary purposes. Private property shall not be taken in any case without due compensation. (Cowart-Florida)
 W77-03503

GENERAL BASIS OF WATER RIGHTS IN UTAH.

Utah Code Ann secs 73-1-1 thru 73-1-11 (1968).

Descriptors: *Water allocation(Policy), *Utah, *Water rights, *Eminent domain, *Beneficial use, Legal aspects, Appropriation, Preferences(Water rights), Prior appropriation, Public rights, Water law, Reservoirs, Dams, Canals, Ditches, Flumes, Tunnels, Pumps, Equipment, Water storage, Water conveyance, Regulation, State jurisdiction.

All waters in the state of Utah, whether above or under the ground, are the property of the public. Beneficial use shall be the basis, the measure, and the limit of all rights to the use of water in the state. When an appropriator or his successor in interest abandons the use for five years, the rights shall cease and such water shall revert to the public. Any person shall have a right of way across public, private, and corporate lands for the construction, maintenance, repair and use of all necessary reservoirs, dams, water gates, canals, ditches, flumes, tunnels, pipelines and areas for setting up pumps and pumping machinery upon payment of just compensation. The purpose of the right of way shall be to secure, store, replace or convey water for domestic, culinary, industrial and irrigation needs. The rights and duties of owners of ditches and canals are enumerated. Provisions are made for the conveyance of water rights. (Cowart-Florida)
 W77-03504

FLOOD CONTROL PROJECTS AND DROUGHT EMERGENCIES.

Utah Code Ann secs 17-8-1 thru -7 (1973), as amended (Supp 1975).

Descriptors: *Eminent domain, *Utah, *Flood control, *Flow control, *Multiple purpose projects, Flood protection, Flood routing, Water distribution(Applied), Water utilization, Droughts, Legislation, Flood plains, River flow, Public health, Administration, Local governments, Federal government, Regulation, Water resources development.
 Identifiers: *Flood channels.

Utah has enacted legislation empowering boards of county commissioners, to contract with the United States for the construction and maintenance of any flood control project within county jurisdiction. In addition to being within the contracting county, the project must be designed to abate or control flood waters, or any excessive accumulation of water, for the protection of life and property. A board may further contract and pay expenses to acquire easements and relocate public roads or bridges when replacement is necessitated by any flood project construction. In addition, the state engineer shall distribute the waters and operate the completed project. County boards are also empowered to authorize the clearing, improving, and fencing of natural channels, the construction of new channels, and to enforce anti-pollution laws within their respective counties. A final provision concerns the protection of flood channels and flood plains. (Lauer-Florida)
 W77-03505

WATER, LIGHTING AND SEWERS.

Utah Code Ann secs 10-7-4, 10-7-12 thru -14.1 (1973).

Descriptors: *Utah, *Water supply, *Cities, *Water rights, *Public health, Water users, Water requirements, Water purification, Construction, Water pollution, Treatment facilities, Water treatment, Municipalities, State governments, Water storage, Public rights, Legislation, Condemnation.

Utah has enacted legislation providing that any city or town may acquire, purchase or lease any water, waterworks system, water supply or property connected therewith. The cities or towns

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

may also bring condemnation proceedings to acquire the above. The resident taxpayers have a right to protest the acquisition of property and a special election is to be held to resolve the protest issue. The cities and towns have also been granted several miscellaneous rights and powers, including the power to limit use of water for any purpose other than domestic in the event of scarcity of water, and the right to enter upon any premises furnished with water by such city or town. It is the public policy of Utah to grant the privilege to municipalities to raise funds to improve health standards by providing facilities for the purification of drinking water and the treatment of raw sewage. (Martin-Florida)
W77-03506

HEAD GATES; POWERS OF STATE ENGINEER.

Utah Code Ann secs 73-5-4 and 73-5-9 (1968).

Descriptors: *Utah, *Water measurement, *Diversion, *Mechanical control, Equipment, Reservoirs, Priorities, Ditches, Regulation, Water allocation(Policy), Water utilization, Flumes, Weirs, Prior appropriations, Water control, Legislation, Construction, Consumptive use, Water distribution(Applied).
Identifiers: *Headgates.

Utah has enacted legislation providing that every person using water in the state shall construct or install and maintain a headgate or other measuring device at each point where water is diverted or turned out for the purpose of regulating and measuring the quantity of water used. These measuring devices must be approved, locked, and kept set by the state engineer. Flumes or other measuring devices may be required at points along ditches to determine the amount of water to be diverted from a stream to the ditch. Owners of reservoirs may also be required to construct and maintain a measuring device above the reservoir on each stream or source of supply discharging into the reservoir in order to determine the amount of water to which prior appropriators are entitled. The state engineer may require the construction of measuring devices to prevent waste, loss, pollution or contamination of water above or below ground. The owner shall incur the expense of complying with any requirement made by the state engineer. If after notice, the owner has not carried out the requirement, the state engineer may forbid the use of such water. (Lauer-Florida)
W77-03507

SUSPENSION AND RESTORATION OF RIGHT TO APPROPRIATE.

Utah Code Ann secs 73-6-1 thru -2 (1968).

Descriptors: *Surplus water, *Utah, *Appropriation, *Water supply, *Water utilization, Water control, Public health, Water allocation(Policy), Water conservation, Beneficial use, Regulation, State governments, Water resources development, Water demand, Unappropriated water.
Identifiers: Water preservation.

Upon recommendation of the state engineer, the governor of Utah may suspend the right of the public to appropriate surplus or unappropriated waters when the welfare of the state demands it. The utilization of surplus and unappropriated waters of any stream may be suspended for any use whatsoever to preserve such waters. Waters withdrawn from appropriation may be restored by proclamation of the governor upon the state engineer's recommendation. Such proclamation shall not become effective until notice has been published within the boundaries of the water source. (Lauer-Florida)
W77-03508

IRRIGATION DISTRICTS.

Utah Code Ann secs 73-7-1 and -11 (1968).

Descriptors: *Irrigation districts, *Utah, *Water management(Applied), *Irrigation, *Water districts, Legislation, Jurisdiction, Water supply, Governments, State jurisdictions, Legal aspects, Administrative agencies, Bodies of water, Reservoirs, Canals, Ditches, Distribution systems, Irrigation programs, Water distribution(Applied), State governments.

In order to conserve public waters of the state of Utah, the governor may propose the organization of irrigation districts. Ditches, canals, reservoirs and franchises constructed before the passage of this act are exempt from this law unless such district shall be formed to purchase, acquire, lease or rent such ditches, canals or reservoirs. Resident entrants upon public lands of the United States and purchasers of state lands shall be deemed to be owners of lands within the district for the purpose of becoming petitioners for the organization of such districts. A board of directors shall have the following powers: (1) to conduct the business of such district; (2) to allot water to each forty-acre tract; (3) to construct or acquire canals, ditches and reservoirs necessary to the operation of the district; (4) to acquire rights of way by condemnation and (5) to rent or lease water. (Cowart-Florida)
W77-03509

PUBLIC INLAND LAKE PROTECTION AND REHABILITATION.

Wis Stat Ann secs 33.001 thru .29 (Supp 1975).

Descriptors: *Administrative agencies, *Wisconsin, *Lakes, *Protection, *Rehabilitation, Environmental effects, Wildlife conservation, Public benefits, Planning, Surveys, Water pollution control, Navigable waters, Data collections, Legislation, State government, Administration, Financing, Legal aspects, Water resources, Water districts.
Identifiers: *Public inland lakes, Districts.

In order to protect and rehabilitate the public inland lakes of this state, the Wisconsin legislature has initiated a comprehensive lake program. The inland lakes protection and rehabilitation council shall advise the department of natural resources on all matters pertaining to lake rehabilitation and the abatement of lake pollution. The primary goal of activity under this chapter shall be to improve the quality of public inland lakes. Districts may undertake rehabilitation projects which shall be divided into study, planning and implementation phases. A district desiring financial assistance shall apply to the department. Districts may be created for the purposes of undertaking a program of lake protection and rehabilitation. Management of the affairs of the district shall be delegated to a board of commissioners. (Martin-Florida)
W77-03510

VILLAGE OF LOMBARD V STATE POLLUTION CONTROL BOARD (POLLUTION CONTROL BOARD WITHOUT AUTHORITY TO IMPOSE REGIONALIZATION UPON LOCAL GOVERNMENTAL BODIES).

346 NE2d 196-202 (Ill App Ct 1976). 7 p.

Descriptors: *Illinois, *Local governments, *Legal review, *Water pollution control, *Administrative agencies, Environmental control, Waste water disposal, Waste water treatment, Regional development, Regions, State governments, State jurisdiction, Legal aspects, Water pollution.

Plaintiff village sought to restrain defendant Pollution Control Board from establishing a county-wide wastewater program. The plaintiff objected to its required inclusion, and claimed that the Board did not have proper authority under Illinois law. The Board asserted that it had broad power to order county-wide regionalization that included the Village of Lombard. The Appellate Court of Illinois held that in the absence of any specific

authority, the Board did not have the power to impose wastewater regionalization on municipalities, sanitary districts, or other local, governmental bodies without their consent. (Frank-Florida)
W77-03511

CLIPPINGER V BIRGE (RIPARIAN RIGHTS IN AN ARTIFICIAL LAKE).

547 P2d 871-80 (Wash Ct App 1976). 10 p, 1 fig.

Descriptors: *Artificial lakes, *Contours, *Washington, *Judicial decisions, *Access routes, *Public access, Public rights, Riparian rights, Riparian waters, Ownership of beds, Roads, Dikes, Erosion, Sea level, Legal aspects.
Identifiers: *Injunctive relief.

Plaintiff owner of an interior lot brought suit against defendant owners of a lot fronting on an artificial lake to enjoin the waterfront owners from interfering with the right of access to the lake by interior lot owners and to recover damages for past interference and harassment. The evidence supported the findings that the contour line as it was fixed at the time of the deed did not shift as erosion or other earth changes caused a shift in the actual location of that point above sea level on the ground. More importantly, the plaintiff was not a riparian owner of the land since his property was not contiguous to the lake and was separated from the lake both by a public road and by a strip of land owned by the defendants. Since the lake was an artificially created private reservoir, there were no riparian rights to its use and any rights parties may have had to use the bed in the waters of the lake must derive from their deed. Injunctive relief was, therefore, denied. (Frank-Florida)
W77-03512

GREAT LAKES COMPACT COMMISSION.

Wis Stat Ann sec 14.78 (1972).

Descriptors: *Wisconsin, *Great Lakes, *Water resources development, *St Lawrence Seaway, *Interstate compacts, Interstate commissions, Inter-agency cooperation, Education, Navigable waters, Lake Michigan, Financing, Inland waterways, Canals, St Lawrence River, Lake Superior, Lakes, Great Lakes Region, Legislation.
Identifiers: *Great Lakes compact commission, *Great Lakes Basin Compact.

Wisconsin has enacted legislation creating the Great Lakes compact commission. The governor shall appoint five commissioners, one of whom shall serve as secretary and be a state employee of indefinite duration. The other positions carry unsalaried four year terms. The commission's duties include: representing Wisconsin on the Great Lakes commission; maintaining a continuing investigation of the St. Lawrence Seaway Project; lobbying for additional legislation to further the development of the waterway; devising and executing an educational program in support of such project; and the filing of annual reports regarding the commission's activities. The Wisconsin commission is, in addition, authorized to contribute to the Great Lakes commission a sum not greater than the amount appropriated for that purpose. Furthermore, the statute directs all state officers, agencies, and employees to aid the commission in furtherance of the Great Lakes Basin compact by providing data, personnel, and any other assistance requested. (Moorhouse-Florida)
W77-03513

1971 SHORELINE MANAGEMENT ACT.

Wash Rev Code Ann secs 90.58.010 thru .030 (Supp 1975).

Descriptors: *Shore protection, *Washington, *Coasts, *Legislation, Shores, Recreation, Public access, Project planning, Natural resources, Long-term planning, Coastal structures, Wetlands, Public rights, Conservation, Preservation,

Ecology, Local governments, High water mark, Streams, Lakes, Tidal waters.
Identifiers: *Coastal zone management.

The state of Washington has enacted a shoreline management act for the purpose of preserving, protecting, restoring and utilizing the natural resources of the shoreline. The policy of the act is to allow all reasonable and appropriate uses while protecting the land, waters, and wildlife from adverse effects. Specific shorelines have been designated 'shorelines of state-wide significance'. Master programs to be developed for these shorelines by local governments shall give preference to shoreline uses which: (1) protect the state interest over the local interest; (2) preserve the natural character of the shorelines; (3) result in long-term rather than short-term benefits; (4) protect the shoreline ecology and resources; (5) increase public access to public areas; and (6) increase public recreational opportunities. Permitted uses must minimize ecological and environmental damage and, where possible, must not impede the public's use of the water. (Capehart-Florida)
W77-03514

IRRIGATION DISTRICTS POWERS AND PURPOSES.

Wash Rev Code Ann secs 87.02.005 and .010 (1962), and .015 (Supp 1975).

Descriptors: *Washington, *Irrigation districts, *Water distribution(Applied), *Irrigation operation and maintenance, *Conveyance structures, Water rights, Conduits, Governments, Sewage treatment, Irrigation, Water contracts, Electric power, Sewers, Hydrants, Contracts, Legislation, Local governments.

Irrigation districts may be organized whenever fifty or a majority of title holders to land susceptible or irrigation desire. The district may be formed for the purpose of: (1) construction or purchase of works for the irrigation of lands; (2) reconstruction or improvement of existing works; (3) operation or maintenance of the works; (4) construction and maintenance of diverting conduits; (5) execution of contracts; and (6) performance of everything necessary to exercise the powers granted to the district. The district has the power to: (1) purchase and sell electric power to the districts' inhabitants; (2) construct and maintain a system for the sale of water to district inhabitants for domestic purposes; (3) maintain drains, sewers, and sewage treatment plants; (4) assume any indebtedness to the United States because of the district lands; (5) construct and maintain water conduits used to carry water used within cities and towns; (6) install and maintain water mains and fire hydrants used for fire fighting; (7) contract with other irrigation districts; and (8) acquire the water system from any water district situated wholly within the irrigation district's boundaries and provide water for domestic use of the district's residents. (Rieck-Florida)
W77-03515

WATERWAY DISTRICTS.

Wash Rev Code Ann secs 91.04.010, .170 thru .200 (1962).

Descriptors: *Channel flow, *Engineering structures, *Washington, *Local governments, Water courses(Legal aspects), River regulation, Beds, Shores, Channels, Legal aspects, Eminent domain, Right-of-way, Construction, Water control, Water flow, Stream flow, River flow, Stream improvement, River beds, Ditches, Canals, Bodies of water, Canal construction, Flumes, Locks, Structures, Dikes, Overflow, River training, Legislation.
Identifiers: *Waterway districts.

Any county or portion thereof requiring commercial waterways may be organized into a commercial waterway district and shall have the right to

sue and be sued in the name of its board of commissioners. The districts shall have: the right of eminent domain to purchase property for use in the commercial waterway system; the power to alter all watercourses flowing through the district; the right to construct all necessary artificial appliances to protect the land or preserve and maintain the waterway system; the power of eminent domain to acquire property for the construction of landing places or other aids to navigation; and the authority to acquire rights of way over any land in the state of Washington provided no city or town's authority to construct in, upon, under, above, or across the waterways shall be impaired, unless this right will materially affect the efficiency of the waterways. Waterway districts are given all rights of the state concerning any beds or shores within the district. This confers the power to sell the beds or shores and use the proceeds for the expenses of the district or to exchange the beds or shores for other needed property. (Rieck-Florida)
W77-03516

EMINENT DOMAIN.

Wash Rev Code Ann secs 8.28.050 and 8.12.030 (1961).

Descriptors: *Washington, *Eminent domain, *Condemnation, *Cities, Watersheds(Basins), Properties, Water pollution, State governments, Swamps, Marshes, Ponds, Aqueducts, Reservoirs, Freshwater, Legislation, Legal aspects, Compensation.

Any municipal corporation of any state adjoining the state of Washington may acquire by purchase or condemnation, title to any land or water right within any watershed in the state of Washington. Every city and town within the state of Washington is authorized and empowered to condemn land and property for various purposes, including: (1) draining swamps, marshes, tidelands, tideflats or ponds, or filling the same, within the limits of the city; (2) constructing aqueducts, reservoirs, pumping stations and other structures, either within or without the city limits, for conveying into and through such city a supply of fresh water; (3) protecting such supply of fresh water from pollution; and (4) building drains and sewers. (Martin-Florida)
W77-03517

GLASSMAN V. WELDEN FARMS, INC. (NO RIGHT IN UPPER LAND OWNER TO ARTIFICIALLY INCREASE THE NATURAL DRAINAGE OF SURFACE WATER TO INCREASE FLOODING ON LAND OF LOWER PROPERTY).
359 A2d 669-81 (Del Ct Ch 1976). 13 p.

Descriptors: *Delaware, *Surface drainage, *Surface waters, *Floods, Judicial decisions, Legal aspects, Rain, Rain water, Water injury, Drainage water, Water law, Water rights, Streams, Competing uses, Riparian rights, Reasonable use, Overflow, Water levels, Banks, Flood damage.

Plaintiffs, lower property owners, brought an action to enjoin defendant, upper property owner, from draining increased amounts of surface water into a small creek which passes through the plaintiffs' property. The county government and the State Department of Highways were joined as defendants to the extent they may be necessary to the granting of complete injunctive relief. Plaintiffs argued that under the law of Delaware an upper landowner may not artificially increase the flow of surface waters upon a lower landowner above the natural level, no matter how minimal the increase may be. Defendant, upper landowner, argued that the test under Delaware law is that of reasonable use, and that in the absence of evidence of substantial injury, the lower landowner has no standing to object to a minimal increase caused by the upper owner. The Court of Chancery granted injunctive relief to the plaintiffs

holding that where intermittent heavy rainfall causes a natural waterway to overflow its banks, an upper landowner may not artificially increase drainage into that waterway in such a manner as to enlarge the area of flooding on the property of the lower owner, regardless of how insubstantial the increase may be. (Coward-Florida)
W77-03518

COMMONWEALTH V. BARNES AND TUCKER COMPANY (PUBLIC NUISANCE OF ACID MINE DRAINAGE).

353 A2d 471-81 (Pa. Commonwealth Ct. 1976). 11 p.

Descriptors: *Pennsylvania, *Coal mines, *Mine drainage, *Acid mine water, *Mine wastes, Mining, Industrial wastes, Mine acids, Acidic water, Coal mine wastes, Deep-well pumping, Judicial decisions, Constitutional law, Legal aspects, Sub-surface waters, Geology, Percolating water, Percolation, Mine water.
Identifiers: Mine hydrology.

Plaintiff, Commonwealth of Pennsylvania, brought an action in equity to require the owner of a closed mine to treat acid mine drainage which was discharging from the mine. Defendant mine owner advanced a number of constitutional arguments, including one that an order abating the discharge as a public nuisance would be an unconstitutional taking of property without just compensation. The Supreme Court of Pennsylvania had found that there was a basis upon which the Commonwealth could be granted relief, and then remanded to the Commonwealth Court for determination of the issue of whether relief should be granted. That court held that the defendant mine owner did not qualify as exempt from the imposition of relief in abatement of a public nuisance for want of conduct or activity by it bearing upon the forces and conditions producing the public nuisance. The court therefore enjoined the defendant from causing or permitting the discharge of untreated acid mine water drainage. (Coward-Florida)
W77-03519

CACHE LA POUDRE WATER USERS ASSOCIATION V GLACIER VIEW MEADOWS (APPROPRIATION OF WATER IN PLAN OF AUGMENTATION).

550 P2d 288-96 (Colo 1976). 9 p.

Descriptors: *Diversion, *Appropriation, *Colorado, *Consumptive use, *Wells, Well permits, Water users, Competing uses, Water utilization, Rivers, Water supply, Water resources, Reservoirs, Water management(Applied), Water rights, Administrative agencies, Diversion losses, Diversion loss returns, Water loss, Preferences(Water rights), Riparian rights.

Appellee, a developer of residential lots in the mountains, sought approval from the water court of two plans of augmentation. The plans would provide future owners of presently unimproved lots with domestic water from wells to be drilled in the future. After the augmentation plans were approved, appellants, a ditch and reservoir company and a non-profit protective association, appealed. The appellants contended that the river in question was overappropriated and that authority for the plan could not be completely predicated upon the exempt status of many of the wells. The Supreme Court of Colorado accepted these two objections, but nevertheless affirmed with some modifications. The plans were valid so long as the diversion of the water did not injure holders of vested rights; furthermore, all the wells involved in the plan were required to be treated as if they were non-exempt. The cause was, therefore, remanded with directions to modify the water court's findings. (Coward-Florida)
W77-03520

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

TALLEY V CARLEY (PRIORITIES TO WATER IN 1963 AMENDMENT TO 82 OKLAHOMA STATUTES ANNOTATED SECTION 1-A).
551 P2d 248-52 (Okla 1976). 5p.

Descriptors: *Oklahoma, *Priorities, *Beneficial use, *Consumptive use, Appropriation, *Irrigation water, Preferences (Water rights), Legal aspects, Streams, Constitutional law, Water law, Legislation, Legal review, Competing uses, Hydrography, Surveys, Riparian rights, Relative rights, Administrative agencies.

Landowners sought to set aside the finding of the District Court that the Water Resources Board's final order of priorities to water from a creek was binding upon them. Appellants' land was upstream approximately one mile north of the land owned by appellees. Both parties asserted beneficial use of water from the creek prior to 1963. The pre-1963 law defining water rights required that a hydrographic survey was necessary to establish rights and priorities. The Supreme Court of Oklahoma held that the 1963 amendments provided that priorities could be determined based upon beneficial use prior to the effective date of the Act, and that priority dated from the initiation of the beneficial use. Therefore, appellants would have been able to establish their priorities under the new schedule, even though a hydrographic survey was never accomplished. The court found that the Water Resources Board failed to give meaningful notice to appellants, so their determination of appellants' priority rights was a nullity. In order to determine appellants' priority, another hearing before the Board was ordered. (Coward-Florida)
W77-03521

FLOOD DISASTER PROTECTION ACT OF 1973.
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6F.
W77-03522

USEFUL MODELING CONCEPTS FOR THE FCD WATER SYSTEM.
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6A.
W77-03524

WATER MANAGEMENT AND REGULATION OF WATER USE.
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6B.
W77-03525

PAINT FORMULATING POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-03526

VIRGINIA STATE PROGRAM FOR CONTROL OF DISCHARGE OF POLLUTANTS TO NAVIGABLE WATERS; APPROVAL.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-03527

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY EFFLUENT LIMITATIONS AND GUIDELINES (AMENDMENTS TO REGULATIONS-BUTADIENE).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.

W77-03528

PROPOSED TOXIC POLLUTANT EFFLUENT STANDARDS.

Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-03529

SECONDARY TREATMENT INFORMATION; BIOCHEMICAL OXYGEN DEMAND, SUSPENDED SOLIDS AND PH.

Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-03530

MARINE SANITATION DEVICE STANDARD.

Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-03531

UNIONS FIGHT A JONES ACT WAIVER.

Business Week, No 2370, p. 44, March 3, 1975. 1 p, 1 photo.

Descriptors: *Oil industry, *Oceans, *Water pollution, *Ships, *Legislation, *United States, Federal government, Legal aspects, Transportation, Natural gas, Oil, Alaska, Massachusetts, Access routes, Distribution, Distribution systems.
Identifiers: *Jones Act, *Unions, *Waivers, *Gas reserves.

The Jones Act, passed in 1920, stipulates that shipping between domestic U. S. ports, including those of Alaska, Hawaii, and Puerto Rico, be carried exclusively in U. S. flagships built in U. S. shipyards and manned by American seamen. Waivers for any of these requirements may be allowed only in the interest of national defense. Currently, New England LNG Inc. wants to use a Liberian ship to carry natural gas supplies from Alaska to Boston. The company says that no ships are available and that gas reserves are needed. The maritime industry, led by the Seafarers International Union, calls it an attempt to dodge shipping taxes and evade the law. A decision on the matter will be forthcoming from the Secretary of the Treasury. (Frank-Florida)
W77-03532

A SWEEPING SEA LAW IN 1976.

Business Week, No 2424, p. 167-68, March 22, 1976. 2 p, 1 tab.

Descriptors: *Continental shelf, *Law of the sea, *United Nations, *Fishing, *Environmental effects, International law, Navigation, Water law, Oceans, Mining, Mining engineering, Manganese, Nickel, Copper, Water pollution, Oil pollution, Legal aspects, Foreign countries.
Identifiers: *Coastal waters, *Water rights (Non-riparian).

The Third United Nations Law of the Sea Conference will attempt to negotiate specific treaty provisions pertaining to the governing of the oceans. As to deep sea mining, the Third World bloc of nations wants an International Sea-bed Authority with broad powers to limit the amount of materials to be extracted, to set prices, and to allocate mining sectors. Besides conserving natural resources, these broad powers would protect the commodity export markets of the developing nations. The developed countries, however, who possess the technology to conduct large-scale deep sea mining ventures, want an International Authority limited to issuing licenses and assuming royalty payments to other countries. Another potentially troublesome issue involves the straits. As territorial waters are expanded to 12 miles from

3, certain straits might be closed off, as they are not 24 miles wide. Among these are the straits of Gibraltar and Dover, as well as the Malacca Straits. If these straits are closed to navigation, oil shipping prices would significantly increase. Pollution is also becoming a point of contention. Some countries want the flag state—the one in which the ship is registered—to be responsible for the enforcement of pollution rules. This would prevent the United States from seizing a Russian ship for polluting waters around Alaska. Fishing rights were thought to be far from settled, but individual countries have signed treaties with each other that set license fees for fishing rights in different areas. Hopefully, this spirit of negotiation will result in an international fishing treaty. (Frank-Florida)
W77-03533

THE HARD JOB OF SAVING LAKE ERIE.

For primary bibliographic entry see Field 5G.
W77-03534

THE COST OF COASTAL ZONING.

Business Week, No. 2430, p. 71, 74, May 3, 1976. 2 p, 1 photo.

Descriptors: *California, *Legislation, *Zoning, *Regulation, *Shore protection, Shores, Condemnation, Condemnation value, Beaches, Seashores, Coastal engineering, Coastal structures, Marsh management, State governments, Regional development, Property values, Legal aspects.
Identifiers: *Coastal zone management, Proposition 20 (Calif).

California has led the nation in protection of the coastline, but it is being challenged at the present time to keep up that standard. Under California's Proposition 20, voters have set up a series of temporary state and regional coastal commissions to lay the groundwork for an eventual statewide coastal zoning plan. The commissions ultimately produced a bill calling for state acquisition of unspoiled natural areas, concentration of coastal growth in already developed areas, maximum access to beaches, and stringent controls over all development in an area running from 1,000 yards to as much as 5 miles inland. Businessmen are fighting the legislation, complaining that building costs will skyrocket and that many jobs will be lost. In a related development concerning inland zoning a United States District Court in *Anarita Ltd. Partnership v. City of Palo Alto* ruled that the city's open-space zoning regulations resulted in inverse condemnation of 515 acres of rolling foothills. The city preferred not to buy the land, but merely to zone it so as to preclude undesirable development. A second trial to assess damages is forthcoming, with the amount expected to be in the millions -- the difference in property values before and after the re-zoning. If the holding is ultimately upheld, it could have a significant impact on stringent coastal area zoning. (Frank-Florida)
W77-03535

THE LEGAL FRAMEWORK FOR PUBLIC PARTICIPATION IN CANADIAN WATER MANAGEMENT.

Canada Centre for Inland Waters, Burlington (Ontario).
C. G. Morley.
Social Science Series No. 14, 1975. 74 p. 71 ref.

Descriptors: *Canada, *Decision making, *Public rights, *Legal aspects, Resources development, Legislation, Common law, Social participation.
Identifiers: *Resource management, *Public participation.

The legal basis for public participation in resource management was examined by focusing on relevant federal and provincial legislation as well as common law cases. It was found that: (1) the Canadian legal system does not guarantee the

citizen a right to participate in resource development and management decisions, (2) under common law, a citizen can be heard by the decision making body and can also make claims for compensation, (3) the system is reactive, since the plaintiff must prove damages and legal redress can only occur after the fact, (4) public hearings, though allowing the presentation of the public's views, are structured, one-way forms of communication which are inadequate to assert environmental rights, (5) the convening of a public hearing is a discretionary power given to an official under federal and provincial legislation, (6) the exercise of this discretion together with the lack of formal channels to express discontent could intensify the political controversy of issues, and (7) public hearings allow the public very little access to the formation of environmental policy. Based on these findings, a number of recommendations are made, the central one being that effective participation in decision making must be established by legislation which makes such participation a legal right. (Luedtke-Wisconsin)

W77-03543

THE OBJECTIVES, PART I OF THE STATE WATER PLAN, (IDAHO WATER RESOURCES BOARD).

Idaho Water Resource Board, Boise.

For primary bibliographic entry see Field 6B.

W77-03544

WATER FOR NEVADA. WATER PLANNING REPORT.

Nevada Div. of Water Resources, Carson City. Office of State Engineer..

For primary bibliographic entry see Field 6B.

W77-03545

IOWA'S WATER RESOURCES PROGRAM PROGRESS AND NEEDS.

Iowa Natural Resources Council, Des Moines.

For primary bibliographic entry see Field 6B.

W77-03547

CALIFORNIA'S GROUND WATER.

California State Dept. of Water Resources, Sacramento. Div. of Planning.

For primary bibliographic entry see Field 4B.

W77-03548

THE CALIFORNIA STATE WATER PROJECT IN 1975.

California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 6B.

W77-03551

THE STATE OF UTAH WATER.

Utah Div. of Water Resources, Salt Lake City.

For primary bibliographic entry see Field 6D.

W77-03560

IOWA WATER RESOURCES FRAMEWORK STUDY PLAN OF STUDY.

Iowa Natural Resources Council, Des Moines. Technical Coordinating Committee.

For primary bibliographic entry see Field 6B.

W77-03561

HURDLES IN THE PATH OF COASTAL PLAN IMPLEMENTATION.

For primary bibliographic entry see Field 6B.

W77-03582

CALIFORNIA WATER PROJECT: LAW AND POLITICS.

California Univ., Berkeley. Dept. of Economics.

P.S. Taylor.

Ecology Law Quarterly, Vol 5, No 1, p 1-52 (1975). 52 p.

Descriptors: *California, *Land reclamation, *Acreage, *Federal Reclamation Law, *Land tenure, *Federal project policy, Arid lands, Projects, Water resources development, Water supply development, Political aspects, Farm units, Water policy, Cost allocation, Cost repayment, Water supply, Water management(Applied), Federal jurisdiction, State jurisdiction, Federal-state water rights conflicts, Legislation, Administrative decisions, Judicial decision.

The California Water Project of 1960 is a classic illustration of large landowners circumventing federal water policy. Although water availability in the arid California farmlands is a major problem, land ownership in the region is concentrated into large holdings and federal reclamation law has excess acreage requirements with 160 acre limits. When federal funding was first authorized in the region during the depression, opposition was small because of resident desperation. Since then a thirty year battle has ensued. The first means of circumvention attempted was state project funding. Economics mitigated otherwise, however, and federal funds were required. Floor battles in the House and Senate followed in attempts to get federal funds with an exemption from the acreage limit. The exemption was defeated but an additional provision for further approval left doors open. The Solicitor of the Interior, in interpreting the Congressional result, determined that Congress intended exemption; thus, when the federal-state contract was sent to Congress for approval it was approved without the acreage limitation. Although California courts had held the limit applicable to the project, when a Federal court decision was sought the large landowners won. (Comer-Florida)

W77-03583

FREEDOM OF BEACH,

R. Bongartz.

N. Y. Times Magazine, p 12-13,27,30-32, July 13, 1975. 6 p, 4 photo.

Descriptors: *Beaches, *Access routes, *Right-of-way, *High water mark, *Law enforcement, Transportation, California, Oregon, Connecticut, Public access, Public rights, Public benefits, Legal aspects, Trespass, Easements, Piers.

Identifiers: *Coastal waters, *Public beach access.

Towns and villages have been trying to regulate the use of shoreline swimming areas for a long time. To protest beach restrictions and 'private' beaches, activists like Ned Coll once a weekend during the summer months, bus black children and their parents from Hartford, Connecticut, into private beach areas around the state. Coll's plan is to emphasize the need for open beaches accessible to all. While in the west, notably in California and Oregon, there are laws protecting beach access for the public, the east lags far behind. A National Open Beaches Bill has been introduced in Congress, but its passage seems uncertain. It would grant to the public the absolute right to use all beaches not owned by the government or set aside for other purposes. The Supreme Court recognizes the mean high tide line as dividing public from private areas. Ned Coll has been leading his charges over beach walls in an attempt to publicize his philosophy that the entire shore of the country should be open to the public. (Frank-Florida)

W77-03584

A CLOSER LOOK AT SOME ISSUES FOR GENERA-OCEANS POLICY, MARINE ENVIRONMENT, AND FISHERIES.

Columbia Univ., New York. School of Law.

L. H. Henkin.

Columbia Journal of Transnational Law, Vol 14, No 1, p 56-79 (1975). 24 p.

Descriptors: *Continental shelf, *Law of the sea, *Treaties, *International law, *Oceans, Navigation, Legal aspects, Fisheries, Commercial fishing, Environmental effects, Environmental control, International waters, Foreign waters, Seas, Bodies of water, United Nations, Governments, Foreign government, United States.

Identifiers: *Coastal waters, *Law of the Seas Conference, Coastal zone management, Territorial seas(Jurisdiction).

In all probability, any law of the sea treaty will extend the territorial sea to twelve miles and provide coastal states with 200 mile economic zones. The impact of such a zone on land-locked nations and those with short coastlines will be grave since virtually all ocean resources will fall within some coastal nation's economic zone. Alternative methods of oceanic subdivision, such as the 'straight baseline' approach, will only lead to greater conflicts. While the present jurisdictional framework allows for exploitation of fisheries and other resources and fails to provide environmental standards for the seas, the economic zone approach offers no significant improvements. Agreements on resource utilization are difficult to reach as each nation ideally wants its own zone exclusively and the free use of the zones of others as well. Similarly, pollution standards also create international controversy. Smaller nations concerned with development oppose environmental obstacles to their growth while larger nations reject a double standard approach. Yet another source of conflict in the proposed treaty is the method of dispute settlement. Ad hoc arbitration lacks uniformity and the International Court of Justice lacks expertise. Therefore, although it may create additional expense and bureaucracy, the establishment of a Law of the Sea Tribunal is preferred. (Moorhouse-Florida)

W77-03585

THE MUDDY ROAD TO CLEAN WATER,

For primary bibliographic entry see Field 5G.

W77-03587

IMPLEMENTING THE NATIONAL WATER POLLUTION CONTROL PERMIT PROGRAM: PROGRESS AND PROBLEMS.

For primary bibliographic entry see Field 5G.

W77-03588

ENVIRONMENTAL CONCERN AS A FACTOR IN COASTAL ZONE DEVELOPMENT: A STUDY OF LOUISIANA CITIZENS,

Louisiana State Univ., Baton Rouge. Dept. of Rural Sociology Research.

For primary bibliographic entry see Field 6G.

W77-03590

COMING SHOWDOWN: OCEAN NATIONALISM AND THE SENATE 200-MILE SHELF BILL.

Villanova Univ., Pa. Inst. of World Order Research.

J. Logue.

America, Vol 133, p 466-69, December 27, 1975. 8 p.

Descriptors: *Continental shelf, *Water resources development, *Law of the sea, *United Nations, *Legal aspects, Treaties, Fishing, Fish harvest, Commercial fish, Fish farming, Fish populations, Organizations, Foreign countries, Governments, Shores, Continental slope, International law, Oceans, Water law, United States, Federal government, Continental margins.

Identifiers: *Coastal zone management, *Economic zones.

A showdown is imminent between the United States Congress and the nations of the world who are trying to negotiate a new Law of the Sea at the Third United Nations Conference. Preliminary

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

votes on the Studd and Magnuson bills in the House and Senate, respectively, indicate that Congress is willing to unilaterally declare a 200-mile economic and fishing territorial limit in United States' waters. Henry Kissinger and others familiar with the international negotiations have pleaded with Congress to delay action, saying that the Law of the Sea Conference and the treaty it could produce are the most important international projects in centuries. Proponents of the bill, however, want protection for the fishing industry, claiming that foreign vessels are taking too much of the continental shelf fish resources. Despite the validity of this contention, it is hoped that cooler heads will prevail in Congress. Most likely, a 200-mile limit will be the result of the Conference, but unilateral American action could seriously impair future international efforts to solve world-wide problems. Also, according to several international law experts, such an action would be in contravention of several treaties to which the United States is now a signatory. (Frank-Florida)

W77-03591

CORPS' NEW LOOK IN FLOOD CONTROL: NO DAMS, LEVEES,

For primary bibliographic entry see Field 4A.
W77-03593

THE PEOPLE'S LAKE,

Save Lake Superior Association, Duluth, Minn.
For primary bibliographic entry see Field 5G.
W77-03594

THOSE NASTY PHOSPHATIC CLAY PONDS,

For primary bibliographic entry see Field 5G.
W77-03596

NORTHWEST MARICULTURE LAWS, Oregon State Univ., Corvallis. Sea Grant Coll. Program; and Oregon State Univ., Ocean Resources Law Program.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 822. Price codes: A03 in paper copy, A01 in microfiche. Northwest Mariculture Laws - Papers and Presentations from a symposium held at the Law Center, University of Oregon, Eugene, Oregon, June 7, 1974; Available from Sea Grant Communications, Oregon State Univ., Corvallis, Or. 97331, (1975). 31 p.

Descriptors: *Marine animals, *Marine fish, *Commercial fishing, *Fish farming, *Aquaculture, Aquatic productivity, Fish, Shellfish, Fish hatcheries, Fish management, Fishery, Oysters, Commercial shellfish, Shellfish farming, Legal aspects, Pacific Coast Region, Salmon, Aquatic life, Law of the Sea, International law. Identifiers: *Mariculture, *Marine aquaculture.

Mariculture or salt water 'fish farming' has been practiced in Northwest fisheries for many years. Recent legislation in Oregon, however, has made new Pacific species available to this growing field of commercial enterprise. The proceedings of a recent symposium on mariculture laws examined the legal implications of establishing and operating a mariculture business, the relationship of Oregon shellfish (specifically oysters) to mariculture, mariculture and the international law of the sea, and the legal aspects of marine aquaculture as compared with those of ownership and use of land for agriculture. The new era of aquaculture was explored, and divergent uses of marine waters analyzed. (Coward-Florida)

W77-03598

WATER RIGHTS,

Wisconsin Univ., Madison.
J. B. MacDonald, and J. H. Beuscher.
(2nd ed. 1973). 659 p, 6 map, 24 photo, 6 illus.

Descriptors: *Water rights, *Riparian rights, *Competing uses, *Legislation, *Legal aspects, Federal-states water rights conflicts, Equitable apportionment, Water law, Federal government, State governments, Local governments, Governmental interrelations, Administrative agency, Abatement, Water pollution control, Regulation, Zoning, Land use, Regions, Water quality control, Penalty (Legal), Judicial decisions, Law enforcement, Legal review, Pollution taxes (Charges). Identifiers: Licenses, Administrative regulations, Water rights (Non-riparian).

This collection of materials focuses on water problem typical of the humid east. Its expanded format is due to the increased volume of legislation and litigation that has taken place nationwide. Results of research undertaken at the University of Wisconsin for the past twenty-five years are included. In addition to traditional materials on diffused surface waters, groundwater and riparian rights laws, means of firming up riparian rights are also stressed. Conflicts between riparian private rights and claims of non-riparian members of the public, particularly concerning recreational uses of water and maintenance of water quality, are given great attention. Shoreline zoning as a means of preserving water quality is considered. Attention is given to federal-state and state-state water law problems. The limitations imposed on private water use by both the state and federal governments are investigated in detail. Various aspects of water pollution abatement are reviewed including: the role of the courts; specialized administrative agencies; restrictive use of shorelines; sanctions, incentives, and charges. Scholarly writings, technical information, and court decisions are included to substantiate all issues presented. (Moorhouse-Florida)

W77-03599

THE WYOMING WATER QUALITY ACT AND THE FEDERAL WATER POLLUTION CON- TROL ACT AMENDMENTS OF 1972: A COM- PARISON,

For primary bibliographic entry see Field 5G.
W77-03600

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: TUSCARAWAS AND ADJACENT TRIBUTARY AREAS, TUSCARAWAS COUNTY, OHIO.

Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W77-03174

FLOOD PLAIN INFORMATION: KASKASKIA RIVER AND TRIBUTARIES, COLES COUNTY, ILLINOIS,

Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 4A.
W77-03175

FLOOD PLAIN INFORMATION: SAN JUAN RIVER AND TRIBUTARIES, FARMINGTON, NEW MEXICO.

Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-03176

FLOOD PLAIN INFORMATION: CON- TOOCOOK RIVER AND NUBANUSIT BROOK, PETERBOROUGH, NEW HAMPSHIRE.

Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-03177

FLOOD PLAIN INFORMATION: CHICOPEE RIVER: CHICOPEE, SPRINGFIELD, LUDLOW,

WILBRAHAM AND PALMER, MAS- SACHUSETTS.

Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-03178

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA: VOLUME I. SUMMARY REPORT; SALT CREEK, HAINES BRANCH AND BEAL SLOUGH, SALT CREEK BASIN.

Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-03179

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA, VOLUME II, SUMMARY RE- PORT, ANTELOPE CREEK, DEAD MANS RUN, AND MIDDLE CREEK, SALT CREEK BASIN.

Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-03180

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA, VOLUME III, SUMMARY RE- PORT, LITTLE SALT, OAK, SALT, AND STEVENS CREEK, SALT CREEK BASIN.

Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-03181

FLOOD PLAIN INFORMATION: WILDCAT CREEK AND KOKOMO CREEK, VICINITY OF KOKOMO, HOWARD COUNTY, INDIANA.

Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W77-03182

FLOOD PLAIN INFORMATION: SCIOTO AND OLENTANGY RIVERS, OHIO, COLUMBUS AREA, SUMMARY REPORT.

Army District Engineers, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W77-03183

NATIONAL PROGRAM FOR MANAGING FLOOD LOSSES: GUIDELINES FOR PREPARA- TION, TRANSMITTAL, AND DISTRIBUTION OF FLOOD-PRONE AREA MAPS AND PAMPHLETS,

Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-03341

FLOOD DISASTER PROTECTION ACT OF 1973,

Central and Southern Florida Flood Control District, West Palm Beach.
D. O. Morgan.
In Depth Report, Vol. 2, No. 5, p. 1-8 (Nov.-Dec. 1974). 8 p, 1 photo, 3 chart.

Descriptors: *Flood protection, *Flood control, *Flood damage, *Flood plain insurance, Legislation, Legal aspects, Flood profiles, Insurance, Compensation, Costs, Damages, Protection, Risks, Disasters, Flood data, Flood plains, Flood water, Water injury, Flood forecasting, Flood frequency, Flood plain zoning, Flooding.

As a result of a flood insurance feasibility study undertaken by the Secretary of Housing and Urban Development in 1966, it was determined that a national flood insurance program was feasible, and could provide subsidized premium rates for property in high risk areas. Subsequently, in 1968 Congress passed the National Flood In-

insurance Act. Improving on the shortcomings of the 1968 Act, the Flood Disaster Protection Act of 1973 expands the limits of insurance coverage, and extends the emergency program for two more years. Further, it creates incentive for flood-prone communities to enter the program, requires insurance on all federal or federally-assisted financing of buildings in flood-prone areas, and establishes explicit procedures for communities wishing to appeal HUD's flood elevation determinations. With these measures the National Flood Insurance Program will be able to provide the certainty of financial protection for anyone who decides that it may be necessary to build in flood-prone areas in the future. (Cowart-Florida) W77-03522

PLAN FOR IMPROVEMENT OF THE DELTA LEVEES.

California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 4A.
W77-03550

CORPS' NEW LOOK IN FLOOD CONTROL: NO DAMS, LEVEES.

For primary bibliographic entry see Field 4A.
W77-03593

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY, PROGRESS REPORT,

Allen County Soil and Water Conservation District, Fort Wayne, Ind.
For primary bibliographic entry see Field 5G.
W77-03106

ASSESSMENT OF POTENTIAL INTERACTIONS OF MICROORGANISMS AND POLLUTANTS RESULTING FROM PETROLEUM DEVELOPMENT ON THE OUTER CONTINENTAL SHELF IN THE BEAUFORT SEA,

Louisville Univ., Ky. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-03217

ASSESSMENT OF POTENTIAL INTERACTIONS OF MICROORGANISMS AND POLLUTANTS RESULTING FROM PETROLEUM DEVELOPMENT ON THE OUTER CONTINENTAL SHELF IN THE GULF OF ALASKA,

Louisville Univ., Ky. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-03218

TRACE HYDROCARBON ANALYSIS IN PREVIOUSLY STUDIED MATRICES AND METHODS DEVELOPMENT FOR: (A) TRACE HYDROCARBON ANALYSIS IN SEA ICE AND AT THE SEA ICE-WATER INTERFACE, (B) ANALYSIS OF INDIVIDUAL HIGH MOLECULAR WEIGHT AROMATIC HYDROCARBONS,

National Bureau of Standards, Washington, D. C. Trace Organic Analysis Group.
For primary bibliographic entry see Field 5A.
W77-03219

ENVIRONMENTAL ASSESSMENT OF ALASKAN WATERS - TRACE ELEMENT METHODOLOGY - INORGANIC ELEMENTS,

National Bureau of Standards, Washington, D. C.
For primary bibliographic entry see Field 5A.
W77-03220

DISTRIBUTION OF LIGHT HYDROCARBONS, C1-C14, IN THE NORTHEAST GULF OF

ALASKA AND THE SOUTHEASTERN BERING SHELF,

National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03221

NATURAL DISTRIBUTION OF TRACE HEAVY METALS AND ENVIRONMENTAL BACKGROUND IN THREE ALASKA SHELF AREAS,

Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W77-03222

BASELINE STUDY OF MICROBIAL ACTIVITY IN THE BEAUFORT SEA AND GULF OF ALASKA AND ANALYSIS OF CRUDE OIL DEGRADATION BY PSYCHROPHILIC BACTERIA,

Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-03223

HYDROCARBONS: NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF,

Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W77-03224

MICROBIAL RELEASE OF SOLUBLE TRACE METALS FROM OIL IMPACTED SEDIMENTS,

Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-03225

INCIDENCE OF PATHOLOGY OF MARINE FISH DISEASES IN THE GULF OF ALASKA, BERING SEA, AND BEAUFORT SEA,

California Univ., Davis.
For primary bibliographic entry see Field 5B.
W77-03226

DEVELOPMENT AND OPERATION OF HF CURRENT-MAPPING RADAR UNITS-PHYSICAL OCEANOGRAPHY,

National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
For primary bibliographic entry see Field 5B.
W77-03227

CURRENT MEASUREMENTS IN THE BEAUFORT SEA,

Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-03228

EFFECTS OF SEASONABILITY AND VARIABILITY OF STREAMFLOW ON NEARSHORE COASTAL AREAS,

Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W77-03229

GULF OF ALASKA STUDY OF MESOSCALE OCEANOGRAPHIC PROCESSES (GAS-MOP),

National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
S. P. Hayes, and J. D. Schumacher.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 11. Physical Oceanography and Meteorology, p 75-106, April 1976. 11 fig, 1 tab, 15 ref. R7120846 and R7120847.

Descriptors: *Alaska, *Circulation, *Ocean circulation, *Ocean currents, *Oil pollution, *Oil spills, *Resources development, *Baseline studies, *Water pollution, *Environmental effects, Meteorology, Seasonal.

Identifiers: *Outer Continental Shelf, *Physical oceanography, *Petroleum resources, Oil exploration, Oil development, Mesoscale processes, Gulf of Alaska.

The objective of this research is to describe the mesoscale oceanic circulation on the continental shelf in the Gulf of Alaska in order to characterize the intermediate scale advective and diffusive processes. These processes are inherently important to the assessment of potential pollution problems due to OCS petroleum development. To date, data collected, processed and analyzed from the Gulf of Alaska indicate the following preliminary conclusions: The mean flow is high (of order 25 cm/sec) and directed to the west generally following the local isobaths. There are considerable variations in the mean flow and in the fluctuations. The flow near Kodiak Island is larger than that measured at other shelf break locations. During winter storm-induced velocity changes are of the same order as the mean flow. These appear to be mainly barotropic and hence linearly related to the sea surface slope. During spring the velocity field is more complex. The fluctuations in the velocity do not correlate simply with the bottom pressure. It appears that nonlocal forcing may be important. The seasonal change in the density stratification is reflected in the coherence of the currents. During winter high coherence from 20 m to 100 m is observed. In the summer the coherence is lower. (Sinha-OEIS)
W77-03230

NUMERICAL STUDIES OF ALASKAN REGION,

National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03231

BRISTOL BAY OCEANOGRAPHIC PROCESSES (B-BOP),

National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03232

STD MAPPINGS OF THE BEAUFORT SEA SHELF,

Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-03233

OUTER CONTINENTAL SHELF ENERGY PROGRAM,

National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5B.
W77-03234

PREPARATION OF HYDRODYNAMICAL-NUMERICAL AND 3-PARAMETER SMALL-MESH ATMOSPHERIC MODELS FOR COASTAL WATERS IN THE GULF OF ALASKA,

Naval Environmental Prediction Research Facility, Monterey, Calif.
For primary bibliographic entry see Field 5B.
W77-03235

MESOSCALE CURRENTS AND WATER MASSES IN THE GULF OF ALASKA,

Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.

Field 6—WATER RESOURCES PLANNING

Group 6G—Ecologic Impact Of Water Development

W77-03236

HISTORICAL AND STATISTICAL OCEANOGRAPHIC DATA ANALYSIS AND SHIP OF OPPORTUNITY PROGRAM,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W77-03237

TRANSPORT OF POLLUTANTS IN THE VICINITY OF PRUDHOE BAY, ALASKA,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 5B.
W77-03238

MARINE CLIMATOLOGY OF THE GULF OF ALASKA AND THE BERING AND BEAUFORT SEAS,
Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
For primary bibliographic entry see Field 5B.
W77-03239

MARINE CLIMATOLOGY OF THE GULF OF ALASKA AND THE BERING AND BEAUFORT SEAS. PART III. CLIMATIC ATLASES,
Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
For primary bibliographic entry see Field 5B.
W77-03240

PHYSICAL OCEANOGRAPHY OF THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5B.
W77-03241

NEAR-SHORE ATMOSPHERIC MODIFICATION,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W77-03242

A SEISMOTECTONIC STUDY OF SEISMIC AND VOLCANIC HAZARDS IN THE PRIBILOF ISLANDS - EASTERN ALEUTIAN ISLANDS REGION OF THE BERING SEA,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W77-03243

COASTAL MORPHOLOGY AND SEDIMENTATION, GULF COAST OF ALASKA (GLACIAL SEDIMENTATION),
Rhode Island Univ., Kingston, Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-03244

COASTAL DYNAMICS AND SEDIMENT TRANSPORTATION, NORTHEAST GULF OF ALASKA,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-03245

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN,
Alaska Univ., College. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-03246

DELINEATION AND ENGINEERING CHARACTERISTICS OF PERMAFROST BENEATH THE BEAUFORT SEA,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W77-03247

DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE GULF OF ALASKA AND SOUTHEASTERN BERING SHELF,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W77-03248

OFFSHORE PERMAFROST STUDIES, BEAUFORT SEA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03249

MARINE ENVIRONMENTAL PROBLEMS IN THE ICE COVERED BEAUFORT SEA SHELF AND COASTAL REGIONS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03250

SURFACE CURRENT OBSERVATIONS - BEAUFORT SEA, 1972,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03251

DISTRIBUTION AND CHARACTER OF ICINGS IN NORTHEASTERN ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2C.
W77-03252

A 'HERRING-BONE' PATTERN OF POSSIBLE TAYLOR-GORTER-TYPE FLOW ORIGIN SEEN IN SONOGRAPHS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W77-03253

HEAVY-MINERAL TRENDS IN THE BEAUFORT SEA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03254

YUKON DELTA COASTAL PROCESSES STUDY,
Wesleyan Univ., Middletown, Conn. Dept. of Earth and Environmental Sciences.
For primary bibliographic entry see Field 2L.
W77-03255

FAULT HISTORY OF THE PRIBILOF ISLAND AND ITS RELEVANCE TO BOTTOM STABILITY IN THE ST. GEORGE BASIN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03256

EARTHQUAKE ACTIVITY AND GROUND SHAKING IN AND ALONG THE EASTERN GULF OF ALASKA,
Geological Survey, Menlo Park, Calif. Office of Earthquake Studies.
For primary bibliographic entry see Field 2L.
W77-03257

EROSION AND DEPOSITION OF SHELF SEDIMENT: EASTERN GULF OF ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03258

FAULTING AND INSTABILITY OF SHELF SEDIMENTS: EASTERN GULF OF ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03259

SEISMIC AND VOLCANIC RISK STUDIES - WESTERN GULF OF ALASKA,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W77-03260

OFFSHORE PERMAFROST-DRILLING, BOUNDARY CONDITIONS, PROPERTIES, PROCESSES AND MODELS,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 5B.
W77-03261

BEAUFORT SEACOAST PERMAFROST STUDIES,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W77-03262

BENTHOS-SEDIMENTARY SUBSTRATE INTERACTIONS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-03263

FAULTING AND INSTABILITY OF SHELF SEDIMENTS - WESTERN GULF OF ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03264

A STUDY OF BEAUFORT SEA COASTAL EROSION - NORTHERN ALASKA,
For primary bibliographic entry see Field 2L.
W77-03266

THE INTERACTION OF OIL WITH SEA ICE IN THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-03267

STUDY OF CLIMATIC EFFECTS ON FAST ICE EXTENT AND ITS SEASONAL DECAY ALONG THE BEAUFORT SEA COAST,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W77-03270

MECHANICS OF ORIGIN OF PRESSURE RIDGES, SHEAR RIDGES AND HUMMOCK FIELDS IN LANDFAST ICE,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W77-03271

EXPERIMENTAL MEASUREMENTS OF SEA ICE FAILURE STRESSES NEAR GROUNDED STRUCTURES,
Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.
W77-03274

BEAUFORT SEA, CHUKCHI SEA, BERING STRAIT HISTORICAL BASELINE ICE STUDY, Alaska Univ., College. Dept. of History. For primary bibliographic entry see Field 2C. W77-03275

ENVIRONMENTAL INVENTORY AND ASSESSMENT OF NAVIGATION POOLS 24, 25, AND 26, UPPER MISSISSIPPI AND LOWER ILLINOIS RIVERS; AN ELECTROFISHING SURVEY OF THE ILLINOIS RIVER, Illinois Natural History Survey, Havana. River Research Lab. For primary bibliographic entry see Field 8I. W77-03302

HYDROLOGY AND ENVIRONMENTAL ASPECTS OF ERIE CANAL (1817-99), Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 8B. W77-03334

ASSATEAGUE ECOLOGICAL STUDIES, Maryland Univ., Solomons. Natural Resources Inst. For primary bibliographic entry see Field 5C. W77-03381

IDAHO ENVIRONMENTAL OVERVIEW, Consulting Engineers, Inc., Boise, Idaho. J. M. Montgomery. November 1975. 261 p. 106 fig., 240 ref., append.

Descriptors: *Census, *Idaho, Data collections, Water resources, Land resources, Environmental effects, Air pollution, Water pollution, Water quality, Wildlife, Fish, Land use, Planning. Identifiers: Panhandle basin(Id), Clearwater-Salmon basin(Id), Southwest basin(Id), Upper Snake basin(Id), Bear River basin(Id).

An inventory of available data and evaluations of existing and potential environmental conditions is provided for use by state agencies involved in planning, administration, resource management, and research. The inventory is divided into five major sections each of which covers one of the five hydrologic basins in the state, the Panhandle, Clearwater-Salmon, Southwest Idaho, Upper Snake, and Bear River. Air quality, aquatic habitat, land use concerns such as flood hazard areas, critical soil and slope, geothermal areas, earthquake zones, deteriorated range or forest conditions, mining impact areas, second home subdivisions, accelerated change, and solid waste disposal sites, water quality, wildlife, and outstanding areas such as rare plants, wildlands, rivers and lakes, and scenic, natural or recreational areas within each of these five basins are summarized in a catalog style presentation cross-referenced to area maps. A bibliography broken down by hydrologic basins is also included, as are lists or organizations and related programs. (Luedtke-Wisconsin) W77-03557

EXPERIMENTAL ECOLOGY OF SELECTED VERTEBRATE SPECIES, Pittsburgh Univ., Pa. R. T. Hartman. Available from the National Technical Information Service, Springfield, VA 22161 as COO-3426-13. Price codes: A03 in paper copy, A01 in microfiche. Progress Report COO-3426-13, July 1975. 31 p., 367 ref. AT(11-1)3426.

Descriptors: *Bibliographies, *Forests, *Small animals(Mammals), *Trees, Coniferous trees, Deciduous trees, Shrubs, Wildlife, Rodents, Deer, Birds. Identifiers: *Mast production, *Seeds, Pine cones, Acorns.

The following papers have been prepared under contract COO-3426: 'The effects of tow-clipping on the survivorship of free-ranging eastern chipmunks' by D.L. Graybill, et al.; 'Seasonal and annual variations in the quantities of nitrogen, potassium phosphorus, magnesium, calcium, and manganese reaching the forest floor as mast in Pennsylvania and Vermont forests' by D.L. Graybill, et al.; 'The effects of season, sex, and cage size on the ingestion, respiration, and body weight of captive eastern chipmunks' by D.L. Graybill; 'Factors affecting home range, and range length of the eastern chipmunk, *Tamias striatus*, in northwestern Pennsylvania' by G.G. West; 'Effect of sublethal exposure to gamma radiation on range parameters in the eastern chipmunk, *Tamias striatus*' by D.P. Snyder, et al.; 'Bibliography of Mast Production' by D.L. Graybill and D.P. Snyder. The latter contains 362 listings, updated to December 1974, and represents research conducted on seed production in forest ecosystems. Although the emphasis is on United States' conifers, secondary emphasis is on oaks, followed by deciduous trees, fruit trees and shrubs. Research from Scandinavia, the United Kingdom, Canada, New Zealand, Europe, Japan, India, USSR, Puerto Rico, Mozambique and Turkey is represented. The nutritive properties of seeds for mammals and birds, seed production, seed crops, management and collection procedures are discussed, as are commercial utilization of nutshells and fruit pits, climatic effects and other aspects of mast production. (Auen-Wisconsin) W77-03564

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION. VOL. 17. INLAND FISHES OF THE LAKE MICHIGAN DRAINAGE BASIN, Argonne National Lab., Ill. G. C. Becker. Report No. ANL/ES-40, Vol. 17, September 1976. 237 p. 111 fig., 1 tab., 295 ref. ERDA W-31-109-Eng-38.

Descriptors: *Watersheds(Basins), *Lake Michigan, *Fishes, *Varieties, *Distribution, Habitats, Spawning, Limiting factors, Value, Aesthetics, Bibliographies, Thermal pollution, Water pollution effects, Michigan, Wisconsin, Indiana, Illinois, Streams, Lakes, Sport fish, Commercial fish.

The distribution of fishes, by family and species, in the streams and lakes of Michigan, Wisconsin, Indiana and Illinois is presented. One-hundred thirty-eight species are found within the Lake Michigan Basin and each species range and abundance, its habitat preferences, spawning requirements (temperature, substrate, water velocity, hatching temperatures, developmental period), feeding habits, and adult size, and temperature, oxygen and pH tolerance are indicated. Information is given as to their commercial value, palatability, demand as sport fish, bait, prey species and/or pet, supplemented by comments on their status, i.e., exterminated, threatened, or prolific, and management procedures, particularly where the status is rare or threatened. Species erroneously reported in this basin and those which did not survive transplantation, did not propagate, or otherwise establish successful populations are briefly treated in a separate section. A bibliography of publications dealing with the effects of thermal and chemical pollutants on fishes as well as species distribution maps are given. (Auen-Wisconsin) W77-03566

A CLOSER LOOK AT SOME ISSUES FOR GENERA-OCEANS POLICY, MARINE ENVIRONMENT, AND FISHERIES, Columbia Univ., New York. School of Law. For primary bibliographic entry see Field 6E. W77-03585

ENVIRONMENTAL CONCERN AS A FACTOR IN COASTAL ZONE DEVELOPMENT: A STUDY OF LOUISIANA CITIZENS, Louisiana State Univ., Baton Rouge. Dept. of Rural Sociology Research. T. K. Pinhey, and K. W. Paterson. Coastal Zone Management Journal, Vol 2, No 3, p 297-310 (1976). 14 p., 5 tab, 17 ref.

Descriptors: *Coastal plains, *Psychological aspects, *Louisiana, *Surveys, *Environmental effects, Environment, Coasts, Shores, Shore protection, Attitudes, Decision making, Social aspects, Motivation, Social impact, Social needs, Social participation, Investigations, Evaluation, Data collections. Identifiers: *Coastal zone management, *Coastal Zone Management Act of 1972(CZMA).

State agencies in charge of implementing the Coastal Zone Management Act of 1972 have perforce become increasingly interested in the views and attitudes of those subject to their rulings. In Louisiana, a statewide sample survey was made which was designed to measure public knowledge of and attitudes toward environmental issues. It was designed to add to previous literature on the subject, which substantiated the theory that the environmental movement is essentially an upper middle class social phenomenon associated with high education, high income, and urban residence. The survey contained 32 questions, used 20 interviewers, and was done with a sample of 926 residents of the state. The results showed that: (1) most people were unaware of current planning efforts; (2) most people felt that the coastal natural environment was valuable and worth protecting; (3) most people felt that the environment of the coastal zone would improve in the future; and (4) blacks were more concerned with natural disasters, while whites worried more about environmental problems. (Frank-Florida) W77-03590

7. RESOURCES DATA

7B. Data Acquisition

ELECTRONIC SENSOR FOR LOW-TO-MEDIUM WINDSPEEDS, Agricultural Research Service, Yakima, Wash. P. A. Boving. Agricultural Engineering, Vol. 57, No. 3, p 20, March 1976. 2 fig, 2 ref.

Descriptors: *Instrumentation, *Winds, *Anemometers, Agriculture, Micrometeorology, Velocity, Flow measurement, Bridges(Electric), Weather, Weather data, Sprays. Identifiers: *Thermistors, *Windspeed sensors, Cup anemometer, Bridge circuit.

A low speed anemometer which uses thermistors as the sensor and in the measuring circuit was described. The bridge circuit operates on 8 volts with an input voltage from 10.5 to 24 volts d-c. The output of the bridge was designed to match the input requirements of an analog recorder also used to record other meteorological signals. The output was found to be accurate to + or - 0.1 mph from 0 to 12 mph. (Jones-ISWS) W77-03099

RADIO-ECHO LAYERS AND THE RECENT STABILITY OF THE WEST ANTARCTIC ICE SHEET, Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies and Ohio State Univ., Columbus. Dept. of Geology and Mineralogy. For primary bibliographic entry see Field 2C. W77-03100

Field 7—RESOURCES DATA

Group 7B—Data Acquisition

A REVIEW OF HAIL-MEASURING INSTRUMENTS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W77-03101

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
R. A. Halliday.
Type I Report, SR 28190, October 1975. 9 p, 1 fig, 1 tab.

Descriptors: *Hydrologic data, *Flood forecasting, *Canada, Inflow, *Data collections, Meteorological data, Satellites(Artificial), Water levels, Projects, *Data transmission, Remote sensing.
Identifiers: *Hydrometric data, *Retransmission, Data collection platforms, Test site, Landsat, Solar panel.

Thirteen Data Collection Platforms, nine GE and four Ball Brothers Research Corporation (BBRC) Convertible Data Collection Platforms model CDCP-100 (CDCP), transmitted hydrometric and meteorological data from remote hydrometric stations within Canada's mainland to Landsat 2. The system met requirements, and the suitability of retransmission by satellite had been demonstrated. Several CDCPs had been checked out at a site on the Bow River below Carseland Dam near Calgary, Alberta. Experiments using one BBRC CDCP were made in the GOES mode, but they were unsuccessful. On the basis of these results, it was apparent that retransmission by satellite is an excellent method of obtaining data from isolated areas. In vast regions of Canada, it is the only way to obtain data on a near real time basis. (Roberts-ISWS)
W77-03111

COMPUTATION OF THE POTENTIAL EVAPOTRANSPIRATION AND THEIR COMPARISON WITH VALUES OF THE ACTUAL EVAPOTRANSPIRATION OF LYSIMETERS, (IN GERMAN),
Ag. armeteorologische Forschungsanstalt, Brunschwick (West Germany).
For primary bibliographic entry see Field 2D.
W77-03118

DISTRIBUTION AND CHARACTER OF ICINGS IN NORTHEASTERN ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2C.
W77-03252

A 'HERRING-BONE' PATTERN OF POSSIBLE TAYLOR-GORTER-TYPE FLOW ORIGIN SEEN IN SONOGRAPHS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W77-03253

MORPHOLOGY OF BERING NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING,
Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.
W77-03272

MORPHOLOGY OF BEAUFORT NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING,
Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.
W77-03273

DEVELOPMENT OF HARDWARE AND PROCEDURES FOR IN-SITU MEASUREMENT OF CREEP IN SEA ICE,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W77-03276

OPERATION OF AN ALASKAN FACILITY FOR APPLICATIONS OF REMOTE-SENSING DATA TO OCS STUDIES,
Alaska Univ., College. Geophysical Inst.
A. E. Belon.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 14. Ice, p 409-456, April 1976. 14 fig, 2 tab, 6 ref, append. 03-5-022-55.

Descriptors: *Alaska, *Sea ice, *Remote sensing, *Sediment transport, *Baseline studies, *Resources development, *Water pollution, *Oil spills, *Oil pollution, Data collections, Navigation.
Identifiers: *Outer Continental Shelf, Petroleum resources, Oil exploration, Oil development, *Fast ice, Suspended sediments.

The primary objective of the project was to assemble available remote-sensing data of the Alaskan outer continental shelf and to assist OCS investigators in the analysis and interpretation of these data to provide a comprehensive assessment of the development and decay of fast ice, sediment plumes and offshore suspended sediment patterns along the Alaskan coast from Yakutat to Demarcation Bay. The acquisition of remote-sensing data, especially satellite data, has proved to be a cost-effective method of monitoring the environment on a synoptic scale. The morphology and dynamics of sea-ice which are relevant to navigation and construction of offshore structures, the patterns of sediment transport and sea-surface circulation which will aid to forecast trajectories of potential oil spills and impact on fisheries, the nature of ecosystems in the near-shore regions which can be changed by human activity, are among the critical development-related environmental parameters which can be studied, in conjunction with appropriate field measurements, and eventually routinely monitored by remote-sensing. The demonstration projects have shown that LANDSAT data can be used effectively for developing models of suspended transport and therefore for preparing contingency plans based on the movement of oil spills in Alaskan coastal waters, for planning navigation routes and offshore drilling structures in coastal areas where sea-ice is prevalent, and for assessing the potential physical and biological impact of developmental activities on the coastal zone. (Sinha-OEIS)
W77-03277

COMPUTER MAPPING OF WATER QUALITY IN SAGINAW BAY WITH LANDSAT DIGITAL DATA,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W77-03305

MEASUREMENT OF NONEXCHANGING PORES DURING MISCIBLE DISPLACEMENT IN SOILS,
Massachusetts Agricultural Experiment Station, Amherst.
For primary bibliographic entry see Field 2G.
W77-03320

CALIBRATION OF NEUTRON PROBE IN SOME SELECTED HAWAIIAN SOILS,
Hawaiian Sugar Planter Association Experiment Station, Honolulu.
For primary bibliographic entry see Field 2G.
W77-03321

A CINE-CAMERA TECHNIQUE FOR PROCESS MEASUREMENT ON A RIDGE AND RUNNEL BEACH,
Reading Univ. (England). Dept. of Geology; and Reading Univ. (England). Sedimentology Research Lab.
For primary bibliographic entry see Field 2L.
W77-03325

MEASUREMENT OF 'TURBIDITY' AND RELATED CHARACTERISTICS OF NATURAL WATERS,
Geological Survey, Reston, Va. Water Resources Div.
R. J. Pickering.
Open-file report 76-153, January 1976. 7 p, 65 ref, append.

Descriptors: *Turbidity, *Optical properties, *Light penetration, *Surface waters, Measurement, Methodology, Standards, Suspended solids, Water quality.

The U.S. Geological Survey, Water Resources Division has adopted the following principles to be used in selecting methods for the measurement of light transmitting characteristics of natural waters: (1) standard instruments and methods are to be adopted to measure and report in optical units, avoiding 'turbidity' as a quantitative measure; (2) reporting of 'turbidity' in JTU's, Hellige units, severity, or NTU's will be phased out; (3) the basis for estimations of sediment concentrations based on light measurements must be documented adequately; and (4) use of transparency measurement by Secchi disk is not changed, although light transmittance may prove to be more precise means of obtaining the same information. A schedule has been established to implement new methods beginning October 1, 1976, and with the transition to be completed at all stations by October 1, 1977. Provisions are provided to meet requirements of cooperators who have legal requirements for 'turbidity' data. (Woodard-USGS)
W77-03339

HIGH-RESOLUTION SEISMIC REFLECTION PROFILING FOR MAPPING SHALLOW AQUIFERS IN LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
T. M. Missimer, and R. A. Gardner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 414/As. Price codes: A03 in paper copy, A01 in microfiche. Water Resources Investigation 76-45, July 1976. 30 p, 14 fig, 1 tab, 9 ref.

Descriptors: *Geologic mapping, *Aquifers, *Sedimentary structures, *Seismic studies, *Florida, Methodology, Hydrogeology, Folds(Geologic), Groundwater, Surface waters.
Identifiers: Lee County(Fla), *Shallow aquifers, Hawthorn Formation(Fla), Tamiami Formation(Fla), Caloosahatchee River(Fla), San Carlos Bay(Fla).

High-resolution continuous seismic reflection profiling equipment was utilized to define the configuration of sedimentary layers underlying part of Lee County, Florida. About 45 miles (72 kilometers) of profile were made on the Caloosahatchee River Estuary and San Carlos Bay. Two different acoustic energy sources, a high resolution boomer and a 45-electrode high resolution sparker, both having a power input of 300 joules, were used to obtain both adequate penetration and good resolution. The seismic profiles show that much of the strata of middle Miocene to Holocene age apparently are extensively folded but not faulted. Initial interpretations indicate that: (1) the top of the Hawthorn Formation (which contains the upper Hawthorn aquifer) has much relief due chiefly to apparent folding; (2) the limestone, sandstone, and unconsolidated sand and phosphorite, which together compose the sandstone aquifer, appear to

be discontinuous; (3) the green clay unit of the Tamiari Formation contains large scale angular beds dipping eastward; and (4) numerous deeply cut alluvium-filled paleochannels underlie the Caloosahatchee River. (Woodard-USGS) W77-03344

METHODS OF DISSOLVED OXYGEN BUDGET ANALYSIS FOR ASSESSING EFFECTS OF DREDGED MATERIAL DISPOSAL ON BIOLOGICAL COMMUNITY METABOLISM, Virginia Univ., Charlottesville, Va.
For primary bibliographic entry see Field 5C.
W77-03393

USE OF INTRINSICALLY SAFE INSTRUMENTATION.
For primary bibliographic entry see Field 5A.
W77-03462

A NEW METHOD OF AUTOMATIC DETERMINATION OF NITRATE IN WASTE WATERS AND POLLUTED SURFACE WATERS (EIN NEUES VERFAHREN ZUR AUTOMATISCHEN NITRAT-BESTIMMUNG IN ABWASSERN UND BELASTETEN OBERFLAECHEWASSERN),
For primary bibliographic entry see Field 5A.
W77-03466

AUTOMATION: A SHORT HISTORY, BUT A LONG FUTURE,
Greeley and Hansen, Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W77-03469

THE AERIAL PHOTO-WATER QUALITY LINK.
For primary bibliographic entry see Field 5A.
W77-03471

7C. Evaluation, Processing and Publication

CORRELATION ANALYSIS OF HYDROMETEOROLOGICAL DATA, Central and Southern Florida Flood Control District, West Palm Beach. Environmental Engineering.
For primary bibliographic entry see Field 2A.
W77-03086

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 5, HYPOTHETICAL FLOODS, Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B.
W77-03104

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 6, WATER SURFACE PROFILES, Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 8B.
W77-03105

A THREE-DIMENSIONAL FINITE ELEMENT GROUND WATER MODEL, California Univ., Davis. Water Science and Engineering Section.
For primary bibliographic entry see Field 2F.
W77-03109

STATE AND COUNTY AREA TABULATIONS FOR THE COLORADO RIVER BASIN, Public Health Service, Denver, Colo. Div. of Water Supply and Pollution Control.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 734. Price codes: A02 in paper copy. A01 in microfiche. January 1962. 21 p, 1 map, 5 tab.

Descriptors: *Drainage area, *Watersheds(Basins), *Colorado River Basin, *Colorado River, Drainage, River basins, Rivers, Interstate rivers, Mapping, *Data collections.
Identifiers: States(Tabulations), Counties(Tabulations).

This report provided drainage area determinations which have been adopted as standard basic data for use in the Colorado River Basin Water Quality Control Project. A check of available data of this type prepared by various public and private agencies revealed slight variations among the various sources. The data contained in this report were developed, therefore, to avoid confusion that might arise if a standard set of these data were not specified for use in this project. Measurements of the drainage area were obtained with a planimeter on the most recent maps available. For the most part, the national topographic series of quadrangle maps of the United States Geological Survey, on a scale of 1:62,500, were used for this purpose. In some instances, maps with a scale of up to 1:250,000 were the best available and were consequently used, although it is recognized that the degree of accuracy in those instances is less than would be desirable. (Sims-ISWS) W77-03110

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA, Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
For primary bibliographic entry see Field 7B.
W77-03111

OPTRM - A HYDROLOGIC TRANSPORT MODEL WITH PARAMETER OPTIMIZATION, Oak Ridge National Lab. Tenn.
For primary bibliographic entry see Field 5B.
W77-03115

SEASONAL DEMARCATION IN PENNSYLVANIA FOR HYDROLOGICAL USE, Massey Univ., Palmerston North (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W77-03127

FIELD MONITORING TECHNIQUES AND DATA ANALYSIS, North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W77-03150

FLOOD PLAIN INFORMATION: TUSCARAWAS AND ADJACENT TRIBUTARY AREAS, TUSCARAWAS COUNTY, OHIO. Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W77-03174

FLOOD PLAIN INFORMATION: KASKASKIA RIVER AND TRIBUTARIES, COLES COUNTY, ILLINOIS, Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 4A.
W77-03175

FLOOD PLAIN INFORMATION: SAN JUAN RIVER AND TRIBUTARIES, FARMINGTON, NEW MEXICO. Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-03176

FLOOD PLAIN INFORMATION: CONTOOCOOK RIVER AND NUBANUSIT BROOK, PETERBOROUGH, NEW HAMPSHIRE. Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-03177

FLOOD PLAIN INFORMATION: CHICOPEE RIVER: CHICOPEE, SPRINGFIELD, LUDLOW, WILBRAHAM AND PALMER, MASSACHUSETTS. Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-03178

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA: VOLUME I, SUMMARY REPORT: SALT CREEK, HAINES BRANCH AND BEAL SLOUGH, SALT CREEK BASIN. Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-03179

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA, VOLUME II, SUMMARY REPORT, ANTELOPE CREEK, DEAD MANS RUN, AND MIDDLE CREEK, SALT CREEK BASIN. Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-03180

FLOOD PLAIN INFORMATION: METROPOLITAN REGION, LINCOLN, NEBRASKA, VOLUME III, SUMMARY REPORT, LITTLE SALT, OAK, SALT, AND STEVENS CREEK, SALT CREEK BASIN. Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-03181

FLOOD PLAIN INFORMATION: WILDCAT CREEK AND KOKOMO CREEK, VICINITY OF KOKOMO, HOWARD COUNTY, INDIANA. Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W77-03182

FLOOD PLAIN INFORMATION: SCIOTO AND OLENTANGY RIVERS, OHIO, COLUMBUS AREA, SUMMARY REPORT. Army District Engineers, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W77-03183

DEVELOPMENT AND OPERATION OF HF CURRENT-MAPPING RADAR UNITS-PHYSICAL OCEANOGRAPHY, National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
For primary bibliographic entry see Field 5B.
W77-03227

STD MAPPINGS OF THE BEAUFORT SEA SHELF, Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-03233

A HISTORICAL SUMMARY OF EARTHQUAKE EPICENTERS IN AND NEAR ALASKA, National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
H. Meyers.

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 13. Geology, p 341-416, April 1976. 6 fig, 6 tab, 13 ref, 7 append. Also as NOAA Technical Memorandum EDS NGSDC-1.

Descriptors: *Alaska, *Earthquakes, *Hazards, *Resources development, *Environmental effects, *Baseline studies, Oil pollution, Water pollution, *Data collections.

Identifiers: *Outer Continental Shelf, Oil exploration, Oil development, Petroleum resources, *Gulf of Alaska, Epicenters.

This publication summarizes the Alaska earthquake data file as presently developed by the National Geophysical and Solar-Terrestrial Data Center (NGSDC). This is a growing file and additional data are being added both for current and historical earthquakes as they are prepared for machine processing. It describes data formats, sources used in developing the data file, and data limitations. Included are several tables which summarize the data in usable forms. The publication also is designed to accompany magnetic tapes, microfilm, and printouts produced from the data file. The data file contains information on earthquakes, known or suspected explosions, and other earth disturbances for the period 1786 through 1974. The file includes for each event the date, origin time, geographic location, focal depth, and magnitude when available. (Sinha-OEIS) W77-03265

DYNAMICS OF NEAR-SHORE ICE (DATA BUOYS),
Washington Univ., Seattle. Dept. of Atmospheric Sciences.

For primary bibliographic entry see Field 2C.
W77-03269

BEAUFORT SEA, CHUKCHI SEA, BERING STRAIT HISTORICAL BASELINE ICE STUDY,
Alaska Univ., College. Dept. of History.
For primary bibliographic entry see Field 2C.
W77-03275

COMPUTER PROGRAMS FOR SEDIMENT TRANSPORT, DOCUMENTATION AND LISTING,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2J.
W77-03298

SALINITY INDUCED HORIZONTAL ESTUARINE CIRCULATION,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-03312

LOW FLOW MODELING IN SMALL STEEP WATERSHEDS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W77-03316

WET AND DRY PERIODS OF ANNUAL FLOW SERIES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power; and Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-03319

SEASONAL VARIATION OF RESIDUAL DRIFT IN LONG ISLAND SOUND,
Connecticut Univ., Groton. Marine Sciences Inst.
For primary bibliographic entry see Field 2L.
W77-03322

MEASURED AND SIMULATED GROUND-WATER LEVELS IN THE FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Albany, N. Y. Water Resources Div.
O. J. Cosner.
Water-Resources Investigations 76-83 (open-file report), 1976. 5 sheets, 3 ref.

Descriptors: *Groundwater resources, *Model studies, *Aquifer characteristics, *Water levels, *Potentiometric level, Computer models, Synoptic analysis, *Maps, Evaluation, Hydrologic data, *Virginia, Coastal plains.
Identifiers: Franklin area(Va).

The Lower Cretaceous aquifer is the principal source of water in Southeastern Virginia. Synoptic water-level measurements made since 1970 have been used to verify a digital model of the aquifer. Measurements made in December 1973, August and December 1974 were used to further verify the model, using updated pumpage for those periods. The close agreement of the potentiometric maps based on measured and simulated water levels indicates that the model is simulating hydrologic conditions satisfactorily. (Woodard-USGS) W77-03326

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN SIMON AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA, AND IN HIDALGO COUNTY, NEW MEXICO--1975,
Geological Survey, Tucson, Ariz. Water Resources Div.
R. P. Wilson, and N. D. White.
Water-Resources Investigations 76-89 (open-file report), July 1976. 2 sheets, 6 ref.

Descriptors: *Water wells, *Groundwater, *Water levels, *Pumping, *Water quality, *Arizona, *New Mexico, *Maps, Sites, Hydrologic data, Hydrographs, Water level fluctuations, Specific conductivity, Fluorides.
Identifiers: *San Simon area(Ariz), Cochise County(Ariz), Graham County(Ariz), Hidalgo County(N Mex).

Arizona is divided into 67 ground-water areas, and individual areas are selected for intensive data collection once every 6 years. The data collected in the San Simon area are given on maps that show depth to water, well depth, and altitude of the water level, 1975; pumpage, 1915-74; and change in water level for 1964-75, hydrographs of the water level in selected wells, specific conductance, and fluoride concentration. Scale 1:125,000. (Woodard-USGS) W77-03327

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN BERNARDINO VALLEY AREA COCHISE COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz. Water Resources Div.
R. P. Wilson.
Water-Resources Investigations 76-81 (open-file report), July 1976. 2 sheets, 2 ref.

Descriptors: *Water wells, *Groundwater, *Water levels, *Water quality, *Arizona, *Maps, Sites, Dissolved solids, Fluorides.
Identifiers: *San Bernardino Valley area(Ariz), Cochise County(Ariz).

Arizona is divided into 67 ground-water areas, and individual areas are selected for intensive data collection once every 6 years. The data collected in the San Bernardino Valley area are given on maps that show depth to water, well depth, and altitude of the water level; and dissolved-solids and fluoride concentrations, 1974. Scale 1:125,000. (Woodard-USGS) W77-03328

GROUND-WATER LEVELS IN NEW MEXICO, 1975,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
J. D. Hudson.
New Mexico, State Engineer Office, Santa Fe, Basic Data Report, 1976. 128 p, 33 fig, 56 tab, 317 ref.

Descriptors: *Groundwater resources, *Observation wells, *Water level fluctuations, *Water utilization, *New Mexico, Hydrologic data, Basic data collections, Aquifers, Bibliographies, Groundwater, Publications.

Water levels in New Mexico are measured periodically in a network of about 1,600 observation wells to record changes in ground-water storage. The areas of water-level observation are within seven of the nine major surface-water drainage basins; most are in areas where ground water is used in large quantities for irrigation, municipal, or industrial purposes. Measurements tabulated were made in January, February, or March 1976 and reflect water-level changes during 1975 when compared with measurements in January or February 1975. Water-level changes indicate a rise in 6 areas and a decline in 21 areas of ground water-level monitoring in New Mexico during 1975. The most significant average rises occurred in the Grants-Bluewater area (+0.83 ft), the Sunshine Valley area (+0.38 ft) and in the Playas basin (+0.19 ft). The largest average declines occurred in Curry County (-3.29 ft), the Carlsbad area (-2.87 ft), and the Northern High Plains (-1.59 ft). Water levels, when averaged for 27 areas of the State, indicate a decline of 0.88 ft. No large changes in irrigated acreage were noted in the State in 1975. A bibliography of more than 300 papers and publications pertaining to ground water in New Mexico published or released to the open file in 1975, with additions from 1886-74 is included. (Woodard-USGS) W77-03330

GROUND-WATER QUALITY DATA FOR GEORGIA,
Geological Survey, Doraville, Ga. Water Resources Div.
R. G. Grantham, and W. R. Stokes.
Geological Survey report, 1976. 216 p, 4 fig, 4 tab, 13 ref. (Prepared in cooperation with the Georgia Department of Natural Resources, Atlanta, Geologic and Water Resources Division.)

Descriptors: *Groundwater resources, *Groundwater availability, *Water quality, *Aquifers, *Georgia, Data collections, Water wells, Sampling, Chemical analysis.

Ground water is found in all the physiographic provinces of Georgia. The Coastal Plain of Georgia has the most abundant supply, while the remainder of the State has supplies in varying amounts depending upon subsurface rock types. Georgia ground waters generally have consistent chemical quality and usually require little or no chemical treatment. Because of the increased use of ground water and its importance to the well-being of the citizens of Georgia, the Georgia Department of Natural Resources has funded the preparation of this report by the U.S. Geological Survey. The report is a compilation of U.S. Geological Survey ground-water-quality data collected from 1938 to 1971. The water samples have been analyzed by U.S. Geological Survey regional laboratories. The samples are from wells for which the location, casing depth, and total depth could be verified. (Woodard-USGS) W77-03333

NATIONAL PROGRAM FOR MANAGING FLOOD LOSSES: GUIDELINES FOR PREPARATION, TRANSMITTAL, AND DISTRIBUTION

OF FLOOD-PRONE AREA MAPS AND PAMPHLETS.
Geological Survey, Reston, Va. Water Resources Div.
G. W. Edelen, Jr.
Open-file report, 1973, revised 1976. 30 p, 1 fig, 4 ref.

Descriptors: *Flood plains, *Mapping, *United States, Methodology, Federal project policy, Floods, Flood plain insurance, *Maps.
Identifiers: *Flood-prone area maps, Preparation guidelines, Mapping techniques.

Information is presented to assist in preparing flood-prone area maps and pamphlets. Background and history of the program, legal authority, analytical techniques, printing, distribution, and other operational details are discussed. House Document 465 of the 89th Congress (1966) recommended a three stage program to delimit major flood hazards: (a) Listing of towns and streams with flood problems, (b) Outlining the flood plain on maps or aerial photographs, and (c) Accelerating the present program of flood-hazard information reports. The U. S. Geological Survey was assigned primary responsibility for item (b). The U. S. Army Corps of Engineers has completed item (a) and has accelerated its program relative to item (c). The scope of the project includes all areas of the United States where flooding from streams, lakes, and tides is a problem. Maps will be produced for areas in the public domain where management or planning decisions are required and for undeveloped areas with recreational potential. (Woodard-USGS)
W77-03341

SELECTED DATA ON WATER WELLS, GEOTHERMAL WELLS, AND OIL TESTS IN IMPERIAL VALLEY, CALIFORNIA.
Geological Survey, Menlo Park, Calif. Water Resources Div.
W. F. Hardt, and J. J. French.
Open-file report, July 1976. 251 p, 5 fig, 5 tab, 7 ref.

Descriptors: *Geothermal studies, *Water wells, *Well data, *Water quality, *California, Basic data collections, Water yield, Water levels, Water utilization, Drawdown, Chemical analysis, Groundwater, Oil.
Identifiers: *Geothermal wells, *Imperial Valley (Calif).

Data from water wells, geothermal wells, and oil tests, including water-quality records, isotope analyses, pressure and temperature information, and drillers' logs are presented for selected wells in Imperial Valley, California. The report should be useful for those involved in geothermal exploration, water development, and power production, as well as professional analysts such as geologists, hydrologists, and modelers of the fluid flow-heat transport system. (Woodard-USGS)
W77-03348

DATA ON SELECTED LAKES IN WASHINGTON, PART 5.
Geological Survey, Tacoma, Wash. Water Resources Div.
N. P. Dion, G. C. Bortleson, J. B. McConnell, and J. K. Innes.
Washington Department of Ecology, Olympia, Water-Supply Bulletin 42, Part 5, 1976. 125 p, 1 fig, 32 ref.

Descriptors: *Lakes, *Washington, *Chemical properties, *Physical properties, *Biological properties, Data collections, Sampling, Water analysis, Chemical analysis, Water quality, Dissolved oxygen, Aerial photography, Bathymetry, Lake morphometry, Maps, Contours, Profiles.

This report, the fifth in a series, contains physical, chemical, and biological data collected from 26

lakes in eastern and western Washington during 1974. Information for each lake includes a description of the physical setting, a general discussion of water quality, a bathymetric map, and an aerial photograph. The basic data include depth profiles of dissolved-oxygen concentration and temperature. Each lake was sampled four times, from winter to late summer. (See also W76-08564 and W74-12341) (Woodard-USGS)
W77-03350

WATER QUALITY SIMULATION OF TAHOE-TRUCKEE SYSTEM, NEVADA-CALIFORNIA - VOLUME II - APPENDICES.
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 5A.
W77-03351

USE OF HYBRID COMPUTER MODEL IN RESOURCE PLANNING.
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6A.
W77-03523

USEFUL MODELING CONCEPTS FOR THE FCD WATER SYSTEM.
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6A.
W77-03524

SIMULATION OF PESTICIDE MOVEMENT ON SMALL AGRICULTURAL WATERSHEDS.
ESL, Inc., Sunnyvale, Calif.
For primary bibliographic entry see Field 5B.
W77-03540

8. ENGINEERING WORKS

8A. Structures

CAVITATION FROM SURFACE IRREGULARITIES IN HIGH VELOCITY.
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 8B.
W77-03082

EXPERIMENTAL INVESTIGATION OF FLOW OVER SIDE WEIRS.
Cairo Univ., Giza (Egypt). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-03317

8B. Hydraulics

MINIMUM UNIT STREAM POWER AND FLUVIAL HYDRAULICS.
Corps of Engineers, Chicago, Ill. North Central Div.
C. T. Yang.
Proceedings of ASCE, Vol. 102, No. HY7, Proc. 12238, July 1976, p. 919-934. 9 fig, 3 tab, 9 ref.
OWRT B-075-ILL(3). 14-31-0001-3881.

Descriptors: *Hydraulics, *Open channel flow, Rivers, *Sediment transport.
Identifiers: *Fluvial hydraulics, Unit stream power.

Fluvial hydraulics is complex because the velocity, slope, depth, and channel roughness are all subject to change. The unit stream power, defined as the rate of potential energy expenditure per unit weight of water, required to transport a given sediment load is sensitive to water depth when the sediment concentration is low. The inter-

dependence between unit stream power and water depth decreases as sediment concentration increases. A computer program is used to generate different combinations of velocity, slope, depth, and unit stream power for a given sediment load. The generated unit stream power in the lower flow regime either has a clear minimum value at a particular depth or approaches a minimum value for a given sediment load. These agreements suggest that an alluvial channel in the lower flow regime adjusts its velocity, slope, depth, and roughness in such a manner that a given sediment load can be transported with the minimum amount of unit stream power.
W77-03080

HYDRODYNAMIC FORCES ON MULTIPLE CIRCULAR CYLINDERS.
Oregon State Univ., Corvallis. Dept. of Civil Engineering.

T. Yamamoto.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12395, p 1193-1210, September 1976. 10 fig, 14 ref, 2 append. NOAA 04-5-158-2.

Descriptors: *Hydrodynamics, *Mathematical studies, *Flow around objects, Analysis, Equations, Vibrations, Waves (Water), Coastal structures, Earthquakes, Flow, Structures.
Identifiers: *Potential flow, *Force coefficients, Cylinders, Forces, Added mass.

The potential flow solution was determined for a number of cylinders in translational motions perpendicular to their axes and submerged in a uniform flow. The number of cylinders, their radii, and the directions of the motions were all arbitrary. The hydrodynamic forces were obtained analytically. For a simplified case of two cylinders, the general hydrodynamic forces were expressed in terms of six force coefficients which are functions of the cylinder radii and the distance between them. However, the coefficients were independent of the direction of motion of the cylinders. The added mass coefficient of a cylinder moving near a rigid boundary in a still fluid is from 2.3 to 1.0, whereas the coefficient of a stationary cylinder near a rigid circular boundary in a uniform flow varies from 5.6 to -1. The results may be useful to the earthquake-resistant design of offshore structures as well as to the wave force design of such structures. (Adams-ISWS)
W77-03081

CAVITATION FROM SURFACE IRREGULARITIES IN HIGH VELOCITY.
Colorado State Univ., Fort Collins.
J. W. Ball.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper No. 12435, p 1283-1297, September 1976. 27 fig, 16 ref, 1 append.

Descriptors: *Cavitation, *Prototype tests, *Hydraulic design, *Design criteria, *Boundaries (Surfaces), Flow characteristics, Hydraulic structures, Spillways, Outlet works, Photography, Construction joints, Structural behavior.
Identifiers: *Cavitation damage, High velocity flow, Cavitation index, Surface roughness.

Irregularities in flow surfaces of hydraulic structures operating at high velocities have been the source of serious damage by cavitation. The types of surfaces often encountered in construction were shown, and many examples of cavitation damage induced by irregularities were shown photographically. Charts from which critical sizes of some of the types can be determined were presented. Methods used to reduce the irregularities to acceptable tolerance were noted, and the use of aeration slots and tunnel offsets used in recent designs to eliminate cavitation damage that would otherwise occur at the irregularities was reviewed. (Adams-ISWS)

Field 8—ENGINEERING WORKS

Group 8B—Hydraulics

W77-03082

QUADRATIC FINITE ELEMENTS IN SHALLOW WATER PROBLEMS,

Universidade Federal do Rio Grande do Sul, Porto Alegre (Brazil).

P. W. Partridge, and C. A. Brebbia.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12418, p 1299-1313, September 1976. 11 fig, 8 ref, 2 append.

Descriptors: *Channels, *Coastal engineering, *Analytical techniques, *Hydrodynamics, *Estuaries, Momentum equation, Numerical analysis, Continuity equation, Tides, Computers, Finite element analysis.

Identifiers: *Implicit scheme, Shallow water equations, Forcing function.

Two quadratic finite element models of the shallow water equations were presented. One model used an explicit fourth order Runge Kutta time integration scheme; the other model used an implicit trapezoidal rule scheme. The shallow water equations comprise two momentum equations and a continuity equation. The models were applied to a rectangular channel, simulating tidal behavior of an estuary. Stability, accuracy, and influence of friction and advective terms on the results were described. Bottom topography was shown to influence the results by changing the nature of the wave in the channel. Advective terms need to be included in the model if there is significant bottom slope. In real situations, the model was started with the water still and the surface flat. In the frictionless situation, spurious wave forms were produced which related to the natural frequencies of the channel. The spurious wave forms may be damped out by the specification of a high level of friction. (Singh-ISWS)

W77-03083

FLOW AND BED TOPOGRAPHY IN CURVED OPEN CHANNELS,

Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.

H. Kikkawa, S. Ikeda, and A. Kitagawa.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12416, p 1327-1342, September 1976. 9 fig, 1 tab, 14 ref, 1 append.

Descriptors: *Curves, *Hydraulics, *Open channel flow, *Beds under water, *Topography, River flow, Meanders, Deposition (Sediments), Scour, Sedimentation, Rivers, Flow, Open channels, Channels.

Identifiers: *Secondary flow.

Mean flow characteristics and bed shear distributions in uniformly curved open channels were studied theoretically, and the results were compared with experiments and field observations. Next, an equation which expresses the variation of transverse bed profile was derived by considering an equilibrium of forces acting on a sand particle. It was shown that the magnitude of the secondary flow and the transverse bed slope determine the direction of sand movement. The numerical solution of the bed variation with time was compared with experiments, and it was concluded that the model employed here describes the bed variation fairly well. The stable profile of the bed was obtained analytically, and from this result, the maximum depth of scour which occurs at the outer banks was calculated. (Bhowmik-ISWS)

W77-03084

EXACT SOLUTION OF GRADUALLY VARIED FLOW,

Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.

M. A. Gill.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12406, p 1353-1364, September 1976. 1 fig, 5 ref, 2 append.

Descriptors: *Gradually varied flow, *Hydraulic design, *Hydraulic gradient, *Numerical analysis, Hydraulics, Slopes, Equations, Mathematical studies, Channels.

Identifiers: *Belanger's equation.

Exact algebraic solutions for the gradually varied flow equation were obtained for several integral and nonintegral values of the hydraulic exponents. A method of obtaining solutions for any value of the hydraulic exponents was explained. It was pointed out that the algebraic solutions can be programmed on computers for any particular flow problem, but these solutions are of academic interest only. (Bhowmik-ISWS)

W77-03085

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 5, HYPOTHETICAL FLOODS,

Hydrologic Engineering Center, Davis, Calif.

L. R. Beard.

Available from the National Technical Information Service, Springfield, Va 22161 as AD-A017 434. Price codes: A09 in paper copy, A01 in microfiche. Report HEC-IHD-0500, March 1975. 191 p, 17 fig, 19 ref, 4 append.

Descriptors: *International Hydrological Decade, *Storms, Hydrographs, Storm structure, Standards, Probable maximum precipitation, Streams, Streamflow, Computer programs, Rainfall-runoff relationships, Simulation analysis, Computer models.

Identifiers: *Storm synthesis, *Storm transportation, Storm centering, Balanced hydrographs, Standard project flood, Probable maximum flood, Storm studies, Stream system, *Hypothetical floods.

Volume 5 of a 12-volume report entitled 'Hydrologic Engineering Methods for Water Resources Development,' discussed techniques and procedures for synthesizing hypothetical rainfall-snowmelt-runoff events. Standard project and probable maximum floods simulation were those used by the Corps of Engineers. Storm centering, use of rainfall frequency data, balanced hydrographs, and several computer programs were discussed. Examples and illustrations were included. The following computer programs were included as appendices: (1) Unit Hydrograph and Hydrograph Computation Computer Program; (2) Hydrograph Combining and Routing Computer Program; (3) Balanced Hydrograph Computer Program; and (4) Streamflow Routing Optimization Computer Program. (See also W77-03105, W74-01642, and W74-13177) (Roberts-ISWS)

W77-03104

HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT, VOLUME 6, WATER SURFACE PROFILES,

Hydrologic Engineering Center, Davis, Calif.

W. A. Thomas.

Available from the National Technical Information Service, Springfield, Va 22161 as AD-A017 435. Price codes: A07 in paper copy, A01 in microfiche. Report HEC-IHD-0600, August 1975. 122 p, 33 fig, 4 tab, 32 ref.

Descriptors: *Hydraulics, *Hydrology, *Water resources development, Free surfaces, Computer models, Mathematical studies, Computers, Automation, Equations, Engineering, Profiles, Computer programs.

Identifiers: *Free surface flow, *Water surface profiles, Energy component.

Volume 6 was part of a 12-volume report entitled 'Hydrologic Engineering Methods for Water

Resources Development,' prepared as a part of the Corps of Engineers' participation in the International Hydrological Decade. This volume related the mathematical equations for flow in natural channels to the physical process. The most common method for solving these basic equations, the standard step method, was developed for complex cross sections using techniques which are suitable for both hand and computer calculations. One of the objectives of this volume was to delineate the degree of simplification that is appropriate for analysis of water surface profiles in natural channels. The procedures were illustrated by solving an example problem by manual computations; however, the more common practice in the Corps of Engineers was to utilize electronic computers to calculate water surface profiles. Programs for this purpose are readily available. (See also W77-03104, W74-01642, and W74-13177) (Roberts-ISWS)

W77-03105

APPLICATION OF A MODEL FOR LAYOUT AND DESIGN OF SEWER SYSTEMS,

Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5B.

W77-03133

SCOUR AROUND BRIDGE PIERS,

West Virginia Univ., Morgantown. Engineering Experiment Station.

G. R. Hopkins, R. W. Vance, and B. Kasraie.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 670. Price codes: A10 in paper copy, A01 in microfiche. Report FHWA-RD-76-56, March 1975. 205 p, 147 fig, 10 tab, 111 ref, 4 append. DOT-FH-11-7759.

Descriptors: *Scour, *Bridges, *Rivers, *Piers, Model studies, Mathematical models, On-site investigations, Measurement, Instrumentation, Equipment, Depth, On-site data collections, Velocity, Fathometers, Water circulation, Erosion, Sediments.

Identifiers: *Pier scour, Scour formulas, Scour instrumentation, Scour field data collection.

Available theories and prediction formulas on scour at bridge waterways were reviewed. Formulas that offer potential for prediction of scour around bridge piers were compared by reducing each formula to a non-dimensional form that includes Froude number, the ratio of scour depth to pier width, and the ratio of stage to pier width. A field study to gather data on scour and related variables was described. The study was aimed at collecting field data in order to furnish a basis on which to compare scour prediction formulas. Four test sites were included in the study. These sites were located on: (1) the Red River in Shreveport, Louisiana; (2) the Brazos River in Richmond, Texas; (3) the Homochitto River near Brookhaven, Mississippi; and (4) the Ohio River in Lawrenceburg, Indiana. An automatic instrumentation system that measures scour depth at three points around a bridge pier as well as river stage was used in this study. The system was based on a depth measuring fathometer. The test protocol and study philosophy were discussed. Data gathered from the field sites were presented and compared to values predicted from scour formulas. Recommendations were made on ways to improve the scour research effort. Recommendations included improved instrumentation systems, additional field studies, laboratory studies computer program development. (Sims-ISWS)

W77-03294

EFFECTS OF A BREAKWATER ON NEARSHORE CURRENTS DUE TO BREAKING WAVES,

Cornell Univ., Ithaca, N.Y. Dept. of Civil Engineering.

P. L.-F. Liu, and C. C. Mei.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A020 028, Price codes: A12 in paper copy, A01 in microfiche. Coastal Engineering Research Center Technical Memorandum No. 57, November 1975. 264 p, 73 fig, 2 tab, 45 ref, 3 append. Army DACW72-72-C-0023.

Descriptors: *Model studies, *Breakwaters, *Currents(Water), Coastal structures, Mathematical models, Shore protection, Waves(Water), Ocean waves, Shores, Refraction(Water waves), Hydraulics, Coastal engineering. Identifiers: Nearshore currents, Offshore breakwaters, Shore-connected breakwaters, Diffraction.

This study provided a semi-empirical theory of nearshore currents due to breaking waves in the presence of a shore-connected breakwater or an offshore breakwater. The effects of diffraction were studied in addition to refraction by shoaling waters. The concept of radiation stresses applied to uniform longshore current and rip currents formed the starting point of the theory. Many empirical relations included in this study with regard to the surf zone are similar to, and extrapolations of, the ones used in related works. Ignoring convective inertia and lateral turbulent diffusion, the governing equations were solved numerically by the method of finite differences. Sample results for stream functions and mean sea levels were plotted for various beach profiles or incidence angles. For the offshore breakwater, the predicted current pattern is consistent with available laboratory observations and the known tendency of tombolo formation; for the shore-connected breakwater, the computed flow pattern exhibits cells in both downwave and upwave regions. Directly relevant observations have not been found, but part of the predicted features has some indirect experimental support. More experimental and theoretical work was suggested. (Sims-ISWS) W77-03297

THE RESPONSE OF NATURAL CHANNELS TO URBANIZATION: TWO CASE STUDIES FROM SOUTHEAST ENGLAND, University Coll., London (England). Dept. of Geography. For primary bibliographic entry see Field 4C. W77-03314

EXPERIMENTAL INVESTIGATION OF FLOW OVER SIDE WEIRS, Cairo Univ., Giza (Egypt). Dept. of Civil Engineering. A. El-Khashab, and K. V. H. Smith. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12402, p 1255-1268, September 1976. 9 fig, 6 ref, 2 append.

Descriptors: *Channels, *Weirs, *Spillways, *Open channel flow, Open channels, Discharge(Water), Hydraulic structures, Hydraulics, Momentum equation, Equations, Computers. Identifiers: *Side weirs, Weir crests, Lateral weirs.

Observations at numerous cross sections in a side weir channel showed that the total energy of flow decreases substantially along the channel, which is contrary to the assumption that has frequently been made. The decrease in total energy occurs because the longitudinal component of velocity of the spill flow is greater than the longitudinal velocity of the flow remaining in the channel. A satisfactory flow equation was derived from momentum principles. The equation was further developed into a computer technique for calculating flow profiles and spill discharges for side weirs. (Lee-ISWS) W77-03317

LANDSLIDE GENERATED WATER WAVE MODEL, Alabama Univ., University. Dept. of Engineering Mechanics. D. C. Raney, and H. L. Butler. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12425, p 1269-1282, September 1976. 9 fig, 1 tab, 8 ref, 2 append.

Descriptors: *Reservoirs, *Montana, *Waves(Water), *Mathematical models, Landslides, Numerical analysis, Hydraulics, Hydrodynamics, Equations, Simulation analysis, Model studies. Identifiers: *Water wave models, Rockfalls.

A numerical model was developed for simulating the development and propagation of landslide generated water waves in reservoirs. The numerical model was based upon a finite difference representation of the depth averaged hydrodynamic equations. The landslide is formulated as a moving boundary condition, propagating into the reservoir, and accelerating the fluid due to physical displacement and viscous drag. Arbitrary reservoir geometry and landslide parameters can be considered. The numerical model results were compared with experimental results obtained on a 1:120 undistorted scale physical model of Libby Dam and Lake Koocanusa in Montana. Landslides were considered, reflecting a wide range of landslide volumes and velocities. The wave heights predicted by the numerical model were in good agreement with the wave heights observed in the physical model. (Lee-ISWS) W77-03318

HYDROLOGY AND ENVIRONMENTAL ASPECTS OF ERIE CANAL (1817-99), Geological Survey, Reston, Va. Water Resources Div. W. B. Langbein. Available from the Supt. of Documents, GPO, Wash., D.C. 20402, Price \$1.20. Water-Supply Paper 2038, 1976. 92 p, 12 fig, 7 tab, 67 ref.

Descriptors: *Canals, *Inland waterways, *Lake Erie, *Transportation, *Environmental effects, Water quality, Water pollution, Floods, Ships, Appraisals, Hydrology, Sediments, Economics, Hydraulics, Land development, History. Identifiers: *Erie Canal.

As the first major water project in the United States, the old Erie Canal provides an example of the hydrological and environmental consequences of water development. The available record shows that the project aroused environmental fears that the canal might be impaired by the adverse hydrologic effects of land development induced by the canal. Water requirements proved greater than anticipated, and problems of floods and hydraulic inefficiencies beset navigation throughout its history. The Erie Canal proved the practicality of major hydraulic works to the extent that operations and maintenance could cope with the burdens of deficiencies in design. Among the large set of effects of the canal upon the water environment that took place but that had not been considered in the planning or design were those on river flows, landforms, ground water, vegetation, and fish migration. The overriding fact that the initial anxieties of the planners proved unwarranted and that environmental conditions did not become intolerable by the standards of that time probably led to neglect of consideration of environmental risks in subsequent public works practice during the 19th century. (Woodard-USGS) W77-03334

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ABOVE SHERWOOD ROAD ON WEST BRANCH DELAWARE RIVER, DELHI, NEW YORK, Geological Survey, Albany, N. Y. Water Resources Div.

For primary bibliographic entry see Field 4A. W77-03337

8C. Hydraulic Machinery

PHYSIOCHEMICAL AND BIOLOGICAL CONDITIONS IN TWO OKLAHOMA RESERVOIRS UNDERGOING ARTIFICIAL DESTRATIFICATION, Oklahoma State Univ., Stillwater. Dept. of Agriculture Engineering. For primary bibliographic entry see Field 2H. W77-03208

MECHANICAL MOLE BURROWS SEWER TUNNEL, Public Works, Vol. 107, No. 11, p 62-63, November, 1976. 1 fig.

Descriptors: *Sewers, *Construction equipment, *Safety, *Tunnelling machines, *Tunnelling, Costs.

The use of a boring machine to create a sewer tunnel in Quincy, Illinois, was evaluated. With this machine, it was possible to build a tunnel with 50 percent increased sewage outflow capacity at no additional costs. Safety margins were greater and the problems associated with blast and drill methods were avoided. The machine bored a tunnel 8 feet, 2 inches, by 5 feet, 3 inches wide as compared to an 8-foot diameter tunnel originally planned. With this method, damage to surrounding rock by blasting was avoided. The horseshoe shape of the board tunnel allowed additional height for maintenance headroom and the smaller arch gives the tunnel greater strength and stability. Tunnel construction proceeded at rates similar to conventional drill and blast methods while overbreak and fracturing due to blasting were avoided. The operation of the machine was similar to a milling machine that shaves metal surfaces. (Collins-FIRL) W77-03397

LARGE FACTORY-BUILT PUMP STATION BEGINS OPERATION, Water and Sewage Works, Vol. 123, No. 8, p 86, August, 1976.

Descriptors: *Pumps, *Sewerage, *Energy, Control systems, Design criteria, Waste water treatment, Equipment, Sewers, Pipelines, Operating costs, Kansas. Identifiers: Pumping stations, Kansas City(Kan).

As part of its new sewage project, Kansas City, Kansas, installed a new pump station. The station employs a variable frequency control system with two 200-hp pumps and another on standby. It can pump 11,250 gallons per minute of waste water up a 77.1 ft head through 44 in. sewer lines. It is designed to provide more interior room and use less steel, and can accommodate a variety of pump types inside. The energy efficient design should provide substantial operational savings. (Collins-FIRL) W77-03438

8D. Soil Mechanics

EARTH AND ROCK-FILL DAMS: BASIS OF THEIR DESIGN AND CONSTRUCTION, SECOND EDITION, S. N. Moiseev.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 217, Price codes: A99 in paper copy, A01 in microfiche. Technical Translation 72-58002, 1975. 647 p, 227 fig, 21 tab, 53 ref. Translation of monograph Kemenn-Zemlianye i Kamennonabrosnye Plotiny Osnovy Proektirovaniya i Stroitelstva, Moscow (USSR), 1970.

Field 8—ENGINEERING WORKS

Group 8D—Soil Mechanics

Descriptors: *Dams, *Dam design, *Dam construction, *Rockfill dams, *Earth dams, Construction, Construction materials, *Design, Maintenance, Dimensions, Foundations, Embankments, Dam foundations, Labor, Soil mechanics, Rocks, Reinforced concrete, Climates, Cold weather construction, Civil engineering.
Identifiers: *USSR.

An analysis of the design, construction, and exploitation of the most economical types of earth-fill and rock-fill dams was given on the basis of local and foreign literature. Great attention was given to the production of work during the time of erection of the dam, the materials used and their preparation, the equipment used in laying the materials in the body of the dam, and the construction of the anti-filtration constructions. Examples of existing dams were mentioned which gives the possibility of choosing the most rational methods of constructing works in accordance with various conditions. (Sims-ISWS)
W77-03102

UNDRAINED BEHAVIOR OF EMBANKMENTS ON NEW LISKEARD VARVED CLAY.
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Constructed Facilities Div.
S. M. Lacasse, C. C. Ladd, and A. K. Barsvary.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 002. Price codes: A04 in paper copy, A01 in microfiche. Report No. R-75-45, June 1975. 58 p, 17 fig, 2 tab, 27 ref, append. R23-0.

Descriptors: *Embankments, *Varves, *Canada, Clays, Bank stability, Stress analysis, Soil strength, Pore pressure, Finite element analysis, Drainage, Anisotropy, Consolidation, Failures, On-site tests, Laboratory tests, Deformation.
Identifiers: *Soft soil, *Undrained pore pressures.

The performance, including a failure, of two embankments in New Liskeard, Canada was analyzed. The underlying 150 ft (45.8 m) of medium-to-soft varved clay was studied with respect to stability, undrained deformations, and excess pore pressure distribution. Total stress stability analyses were performed with undrained strengths based on measured and corrected field vane strengths, the average UC and UU strength, and SHANSEP strength parameters with and without anisotropy. Several approaches yielded satisfactory factors of safety and reasonable critical arcs. Effective stress analyses using pore pressures predicted from finite element analyses showed that either the effective stress strength parameters were much lower than those measured in the laboratory or the predicted pore pressures at failure were much too low. Undrained deformations and excess pore pressures at end of construction were predicted with the finite element program FEECON. The values were generally consistent with field measurements for an embankment located 200 ft (61.0 m) from the failure area. (Visocky-ISWS)
W77-03108

PIPING IN EARTH DAMS CONSTRUCTED OF DISPERSIVE CLAY: LITERATURE REVIEW AND DESIGN OF LABORATORY TESTS.
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
E. B. Perry.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A018 695. Price codes: A07 in paper copy, A01 in microfiche. Technical Report S-75-15, November 1975. 125 p, 66 fig, 10 tab, 142 ref, 3 append.

Descriptors: *Earth dams, *Porous media, *Saturated flow, *Hydraulic structures, *Reviews, *Australia, Laboratory tests, Laboratory equipment, Soil analysis, Testing, Soil erosion, Soil chemical properties, Soil physical properties,

Soil mechanics, Pore pressure, Cohesive soils, Clays, Illite, Publications, Clay minerals, Kaolinite, Montmorillonite, Permeameters, Seepage.
Identifiers: *Piping(Erosion), Dispersive clays, Crumb test.

It was assumed when empirical piping criteria were developed 25 years ago that soil type and method of construction were the main parameters controlling the resistance of homogeneous earth dams to piping failure. Research on piping failure in earth dams constructed of dispersive clay (a particular type of soil in which the clay fraction erodes in the presence of water by a process of deflocculation) was initiated in Australia about 15 years ago. This research resulted in a method of analysis to assess the susceptibility of a homogeneous earth dam, constructed of predominately illite or montmorillonite clay, to dispersive clay piping. The first study of dispersive clay in the United States, reported in 1972, developed a relationship between percent sodium and total soluble salts in the soil pore water extract and field performance of earth dams as evidenced by piping failure or rainfall erosion damage. This research has demonstrated the usefulness of the pinhole erosion test as a method of identifying dispersive clays, shown the feasibility of using filters to prevent piping in dispersive clays, and indicated that stabilization of dispersive clays is possible. A laboratory pinhole erosion apparatus was designed and constructed at the Waterways Experiment Station (WES). A series of laboratory tests was designed to standardize a procedure for use of the pinhole erosion test as a method of identifying dispersive clays, evaluating the effectiveness of filters in preventing piping in dispersive soils, and determining the influence of selected parameters on erodibility of dispersive clays. The procedure for conducting the Crumb Test was given in Appendix A, and Appendixes B and C present detailed drawings and photographs, respectively, of the WES laboratory erosion test apparatus. (Humphreys-ISWS)
W77-03112

8E. Rock Mechanics and Geology

EARTH AND ROCK-FILL DAMS: BASIS OF THEIR DESIGN AND CONSTRUCTION, SECOND EDITION.
For primary bibliographic entry see Field 8D.
W77-03102

A SEISMOTECTONIC STUDY OF SEISMIC AND VOLCANIC HAZARDS IN THE PRIBILOF ISLANDS - EASTERN ALEUTIAN ISLANDS REGION OF THE BERING SEA.
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W77-03243

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN.
Alaska Univ., College. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-03246

DELINEATION AND ENGINEERING CHARACTERISTICS OF PERMAFROST BENEATH THE BEAUFORT SEA.
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W77-03247

YUKON DELTA COASTAL PROCESSES STUDY.
Wesleyan Univ., Middletown, Conn. Dept. of Earth and Environmental Sciences.
For primary bibliographic entry see Field 2L.
W77-03255

FAULT HISTORY OF THE PRIBILOF ISLAND AND ITS RELEVANCE TO BOTTOM STABILITY IN THE ST. GEORGE BASIN.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03256

EARTHQUAKE ACTIVITY AND GROUND SHAKING IN AND ALONG THE EASTERN GULF OF ALASKA.
Geological Survey, Menlo Park, Calif. Office of Earthquake Studies.
For primary bibliographic entry see Field 2L.
W77-03257

EROSION AND DEPOSITION OF SHELF SEDIMENT: EASTERN GULF OF ALASKA.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03258

FAULTING AND INSTABILITY OF SHELF SEDIMENTS: EASTERN GULF OF ALASKA.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03259

SEISMIC AND VOLCANIC RISK STUDIES - WESTERN GULF OF ALASKA.
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W77-03260

OFFSHORE PERMAFROST-DRILLING, BOUNDARY CONDITIONS, PROPERTIES, PROCESSES AND MODELS.
Alaska, Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 5B.
W77-03261

BENTHOS-SEDIMENTARY SUBSTRATE INTERACTIONS.
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-03263

FAULTING AND INSTABILITY OF SHELF SEDIMENTS - WESTERN GULF OF ALASKA.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W77-03264

A HISTORICAL SUMMARY OF EARTHQUAKE EPICENTERS IN AND NEAR ALASKA.
National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
For primary bibliographic entry see Field 7C.
W77-03265

A STUDY OF BEAUFORT SEA COASTAL EROSION - NORTHERN ALASKA.
For primary bibliographic entry see Field 2L.
W77-03266

DYNAMICS OF NEAR-SHORE ICE.
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W77-03268

DYNAMICS OF NEAR-SHORE ICE (DATA BUOYS), Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2C.
W77-03269

STUDY OF CLIMATIC EFFECTS ON FAST ICE EXTENT AND ITS SEASONAL DECAY ALONG THE BEAUFORT SEA COAST, Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W77-03270

MECHANICS OF ORIGIN OF PRESSURE RIDGES, SHEAR RIDGES AND HUMMOCK FIELDS IN LANDFAST ICE, Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W77-03271

MORPHOLOGY OF BEAUFORT NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING, Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.
W77-03273

EXPERIMENTAL MEASUREMENTS OF SEA ICE FAILURE STRESSES NEAR GROUNDED STRUCTURES, Alaska Univ., College. OCS Coordination Office.
For primary bibliographic entry see Field 2C.
W77-03274

BEAUFORT SEA, CHUKCHI SEA, BERING STRAIT HISTORICAL BASELINE ICE STUDY, Alaska Univ., College. Dept. of History.
For primary bibliographic entry see Field 2C.
W77-03275

DEVELOPMENT OF HARDWARE AND PROCEDURES FOR IN-SITU MEASUREMENT OF CREEP IN SEA ICE, Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W77-03276

OPERATION OF AN ALASKAN FACILITY FOR APPLICATIONS OF REMOTE-SENSING DATA TO OCS STUDIES, Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 7B.
W77-03277

8F. Concrete

AN EVALUATION OF SELECTED INSTRUMENTS USED TO MEASURE THE MOISTURE CONTENT OF HARDENED CONCRETE, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Concrete Lab.
E. F. O'Neil, and J. E. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 601. Price codes: A02 in paper copy, A01 in microfiche. Technical Report C-76-1, February 1976. 69 p, 8 fig, 33 plates, 2 ref.

Descriptors: *Concretes, *Moisture content, *Instrumentation, Measurement, Equipment, Evaluation, Laboratory tests, Moisture meters, Gages, Construction, Construction materials, Materials engineering, Civil engineering.
Identifiers: *Concrete moisture.

Six types of gages for measuring moisture content of hardened concrete were studied to determine

their behavior in long-term service. The gages were evaluated with respect to stability of measurement and response to moisture change. The gages were mounted in a 12- by 12- by 18-in copper box, and the box was filled with concrete and a copper lid soldered to it. The gages were monitored for a period of 800 days. For the first 194 days, the gages were read in a hermetically sealed environment. Then, for 326 days (194 to 520 days), the copper lid was removed and the box was exposed to a 50% relative humidity atmosphere. From 520 to 722 days, the concrete specimen was exposed to 50% relative humidity after being entirely removed from the copper box. For the last 78 days of the test, from 722 to 800 days, the bare concrete block was monitored in a 100% relative humidity atmosphere (fog room). The results of the test indicated that two gages (the ionic barrier moisture gage and the Bouyoucos moisture gage) reacted the most favorably during the entire 800-day test period. Both of the mentioned types of gages gave results that were responsive to environmental changes and stable with respect to time. (Sims-ISWS)
W77-03295

8G. Materials

PLASTIC-REINFORCED ASPHALT SEEPAGE BARRIER, Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W77-03120

AN EVALUATION OF SELECTED INSTRUMENTS USED TO MEASURE THE MOISTURE CONTENT OF HARDENED CONCRETE, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Concrete Lab.
For primary bibliographic entry see Field 8F.
W77-03295

STRENGTH OF ICE UNDER MULTIAXIAL LOADING, Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 2C.
W77-03301

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST REPORT, Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03306

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX A, OPERATIONAL AND WATER QUALITY DATA, 1968, Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03307

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX B, OPERATIONAL AND WATER QUALITY DATA, 1969, Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03308

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX C, OPERATIONAL AND WATER QUALITY DATA, 1970, Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W77-03309

ALLATOONA LAKE, DESTRATIFICATION EQUIPMENT TEST, APPENDIX D, EFFECTS OF ARTIFICIAL DESTRATIFICATION ON

TEMPERATURE AND DISSOLVED OXYGEN IN ALLATOONA RESERVOIR, Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 5G.
W77-03310

SHIP-TO-SHORE SEWAGE HOSE HANDLING TESTS, Civil Engineering Lab. (Navy), Port Hueneme, Calif.
For primary bibliographic entry see Field 5D.
W77-03364

DUCTILE IRON PIPE SOLVES A TOUGH SEWER PROBLEM AT JIMERSON CREEK, T. F. Stroud.
Ductile Iron Pipe News, p 9-11, Spring-Summer, 1976.

Descriptors: *Sewerage, *Pipelines, *Iron, Maintenance, Waste water treatment, Infiltration, Inflow, Joints(Connections), Construction materials.
Identifiers: *Ductile iron pipe, Rubber gaskets.

Ductile pipe was used to replace deteriorated sewer piping at Jimerson Creek near Little Rock, Arkansas. Ductile iron pipe was chosen because of its ability to withstand harsh bedding conditions without breaking and the protection it provides against large rocks and other debris in the Creek. Permanence and low-maintenance needs were also prime considerations. Rubber-gasketed joints helped to eliminate infiltration/inflow which had been a problem with the older concrete mortar joints previously used. Completed in 1975, the ductile iron line performed much as expected. (Collins-FIRL)
W77-03398

INNOVATIONS IN SEWER DESIGN AND CONSTRUCTION, Richardson (Edward H.) Associates, Inc., Newark, Del.
D. L. Willis.
Public Works, Vol. 107, No. 11, p 44-47, November, 1976.

Descriptors: *Sewerage, *Manholes, *Cost analysis, *Plastic pipes, *Construction equipment, Construction costs, Delaware, Pipelines, Safety factors.
Identifiers: *Trenchless sewers.

A trenchless sewer construction demonstration (E.P.A. Project No. S-800690) was described. The project's purpose was the development of construction techniques in which it would not be necessary to have a man enter a construction trench. Another design intent was the redefinition of relative factors such as manhole needs and design. Bethany Beach, Delaware, was chosen as the demonstration site. Preliminary cost studies projected as much as 25 percent savings over traditional construction methods. The machinery involved plows open an earth section and pulls in a length of polyethylene pipe. There were minor problems with pipe tension, 'floating' pipes, and cold-weather brittleness of the PVS pipes. The fiscal savings and safety aspects of this construction method are expected to make it an attractive alternative to more traditional procedures. (Collins-FIRL)
W77-03399

PRECAUTIONS TO BE TAKEN IN THE CONSTRUCTION AND MAINTENANCE OF WATER SUPPLY AND SEWER SYSTEMS (PRECAUTIONS A PRENDRE DANS LA CONSTRUCTION ET L'ENTRETIEN DES RESEAUX D' AQUEDEC ET D' EGOUT), Yvan Asselin.
Eau du Quebec, Vol. 9, No. 3, p 8-9, August, 1976.

Field 8—ENGINEERING WORKS

Group 8G—Materials

Descriptors: *Surveys, *Inspection, *Maintenance, *Water supply, *Sewerage, Water distribution (Applied), Pipelines, Valves, *Canada. Identifiers: Fountains, Quebec.

A survey performed on the water treatment practices of the 155 towns in Quebec with populations of 5000 or more revealed that the levels of inspection and cleaning of water lines were generally low. Improvements in quality and service could be achieved by checking valve operation at least twice a year, checking operation of street fountains three or four times a year, cleaning the water lines at least twice a year, checking the sewage lines regularly and cleaning them at least twice a year, and seeking and eliminating leakage. Application of modern construction techniques can eliminate many potential or actual problems; these techniques include proper preparation of the pipe beds, packing a filler around the pipes, sealing the joints with rubber, providing inspection points with constrictions to maintain flow speeds, ensuring easy access to inspection sites, firmly connecting the cesspools, providing for electrical conductivity of water supply lines, selecting optimal valves, and establishing proper anchoring and drainage for street fountains. Modern devices are available for leakage and continuity detection. (Text in French) (Henson-FIRL) W77-03400

INFILTRATION/INFLOW IMPROVEMENTS IN THE OYSTER BAY SEWER DISTRICT, Holzmacher, McLendon and Murrell, Melville, N. Y.

For primary bibliographic entry see Field 5D. W77-03401

CONDUCTING SEWER SYSTEM EVALUATIONS FOR SMALL SYSTEMS, For primary bibliographic entry see Field 5D. W77-03581

8I. Fisheries Engineering

ENVIRONMENTAL INVENTORY AND ASSESSMENT OF NAVIGATION POOLS 24, 25, AND 26, UPPER MISSISSIPPI AND LOWER ILLINOIS RIVERS; AN ELECTROFISHING SURVEY OF THE ILLINOIS RIVER, Illinois Natural History Survey, Havana. River Research Lab. R. E. Sparks. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A020 069. Price codes: A06 in paper copy, A01 in microfiche. Contract Report Y-75-4, December 1975. 122 p, 5 fig, 36 tab, 67 ref. Army DACW39-74-M-3084.

Descriptors: *Rivers, *Fish, *Mississippi River, *Surveys, *Fish populations, Navigable rivers, Electro-fishing, Fish food organisms, Fish types, Freshwater fish, Pollutants, Fish diseases, Sediments, Turbidity, Suspended solids, Water pollution, Water pollution sources, Water pollution effects, Water levels, Fisheries, Commercial fishing, Biology. Identifiers: *Illinois River.

The fish populations of the Illinois River were sampled in the autumn of 1974 by means of a 220-volt AC electroshocker. The sampling was done as part of an environmental inventory and assessment of effects of maintenance and operation of the 9-ft navigation channel in Pools 24, 25, and 26 on the Upper Mississippi River and lower 80 miles of the Illinois River. Comparative data were available from similar electro-fishing surveys conducted from 1959 through 1973. Commercial fishing statistics and results of earlier fish surveys were available as far back as the 1870's. The Illinois River begins at the confluence of the Kan-kakee and Des Plaines Rivers. The effect of mu-

nicipal and industrial discharges from the Chicago-Joliet area was evident in electro-fishing catches from the Des Plaines River—only the introduced carp, goldfish, and hybrids of these two pollution-tolerant species were abundant, and most were diseased. There was a greater variety and abundance of fishes in the Illinois River compared to the Des Plaines River, and the fish were generally in better condition. The greatest catches of commercial and game fishes came from La Grange and Peoria Pools (Middle Illinois River), which have the largest connecting lake area. Impacts of physical-chemical changes in the river on the fish populations were reported. (Sims-ISWS) W77-03302

LIMNOLOGICAL CHARACTERISTICS OF STRIP MINE PONDS IN NORTHWESTERN COLORADO, U.S.A., For primary bibliographic entry see Field 5C. W77-03538

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT, 1975-1976, (HAWAII WATER RESOURCES RESEARCH CENTER), Hawaii Univ., Honolulu. Water Resources Research Center. For primary bibliographic entry see Field 9D. W77-03165

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT, 1975-1976, (HAWAII WATER RESOURCES RESEARCH CENTER), Hawaii Univ., Honolulu. Water Resources Research Center. Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 349. Price codes: A04 in paper copy, A01 in microfiche. (1976), 74 p. OWRT A-999-HI(13).

Descriptors: *Projects, Information exchange, *Water Resources Institute, *Hawaii, *Research and development, *Universities, Colleges, Training, Grants, Contracts, Education. Identifiers: Water research programs, Annual report (Hawaii).

An unusual Water Resource Research accomplishment of the year's program was the first major review of the state's critical water problems and the planning for research and data collection to solve Hawaii's problems in a joint study by the Hawaii Water Resources Regional Study and the Center. Among 9 water problem areas, over 20 specific study needs were identified. An unprecedented number of projects (34) comprised the year's program and the concentration of projects was in the field of water and sediment qualities and biota. Laboratory analytical methodology was established for identifying possible carcinogens in water, municipal waste waters were tested for pesticides and heavy metals, algal growth potential was determined for natural and waste waters. Water supply, flood, and drought-related research and data collection systems were conducted. Groundwater and the associated water infiltration through soils were studied. Water recycling from municipal and domestic waste water effluent for sugarcane irrigation gained acceptance not only as a supplement to the agricultural water supply, but also as an alternative to ocean disposal of waste water for the islands of Oahu, Maui, and Kauai. The study of pathogenic enteric viruses associated with sewage continued to be a major research program of the Center. W77-03165

REPORT ON TENTH ANNUAL WATER RESOURCES RESEARCH CONFERENCE, SPONSORED BY OFFICE OF WATER RESEARCH AND TECHNOLOGY, APRIL 9-10, 1975.

Office of Water Research and Technology, Washington, D. C. Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 444. Price codes: A05 in paper copy, A01 in microfiche. (1976), 95 p.

Descriptors: *Conferences, Water resources institute, *Water Resources Research Act, *Research and development, *Allotments, Federal government, *Research priorities, *Federal project policy, Grants, Contracts, Federal budgets, State governments.

The tenth conference, held under the auspices of the newly formed Office of Water Research and Technology (a creation which consolidated the activities of the Office of Water Resources Research and the Office of Saline Water) convened in Washington, D. C., April 9-10, 1975. The assemblage constituted persons involved in water programs, such as the Directors of the State Water Resources Research Institutes and other representatives and observers, from the entire spectrum of the nationwide water community, including for the first time, representatives concerned with saline water conversion activities. The 1975 Conference theme focused on Technology Transfer. The four plenary sessions delved into topics such as the Congressional viewpoint regarding the water program, technology transfer in action, a review of the saline water conversion program and a presentation on the recommendations of the 1974 Water Resources Research Advisory Panel highlight was a presentation by Dr. A. R. Chamberlain, President of Colorado State University, representing the National Association of State Universities and Land Grant Colleges on the Joint Department of the Interior/NASULGC Water Research and Education Advisory Committee. W77-03206

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PUBLICATIONS LIST OF THE IDAHO WATER RESOURCES RESEARCH INSTITUTE, Idaho Univ., Moscow. Water Resources Research Inst.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 373. Price codes: A04 in paper copy, A01 in microfiche. April 1976, 35 p. OWRT A-999-IDA(7).

Descriptors: *Bibliographies, Information retrieval, *Publications, *Idaho, *Water Resources Institute, Grants, Contracts, Documentation, *Information exchange.

Compilation has been made of all reports, theses, and journal articles prepared in conjunction with research activities of the Idaho Water Resources Research Institute. Both an author and a subject index are used to assist the reader in locating individual reports. The publications are listed by project under four main headings: OWRT Allotment project; OWRT Matching Grant projects; OWRT Title II projects; and miscellaneous publications. (Trihey-Idaho) W77-03154

1973 WESTERN STATE CONFERENCE ON WATER INFORMATION DISSEMINATION. Arizona Water Resources Research Center, Tucson.

SCIENTIFIC AND TECHNICAL INFORMATION—Field 10

Specialized Information Center Services—Group 10D

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 350. Price codes: A05 in paper copy, A01 in microfiche. Proceedings of a Conference, June 8, 1973. Phoenix, Arizona, 98 p. K.J. DeCook and K. E. Foster, editors. OWRT A-031-ARIZ(1). 14-31-0001-5003.

Descriptors: Bibliographies, Data collections, *Data storage and retrieval, *Conferences, Data transmission, *Information exchange, *Documentation, Information retrieval. Identifiers: *Information dissemination, *Western United States.

Reports on current water information dissemination activities by the states stressed that each of us needs to know what the other is doing; duplication of effort among the several State water institutes or agencies is to be avoided; and for what duplication already exists, the antidote is coordination of effort. It was also brought out that the public increasingly wishes to be involved in water resources planning, so that an interpersonal researcher-user contact seems to be required. To establish the desired contact, some kind of common language is needed by which water information and research results can be translated into terms meaningful to the user. Toward this end, specialists are needed who can at once understand the researcher's language and also comprehend the user's practical needs. In the State panel discussion it was recognized that more water information is available than can be assimilated in fragmented form by the public sectors; the intermediary therefore must develop 'organized information' and convey it in some structured form to the user. In the Interstate panel discussion it was suggested that, where a credibility gap exists between research and its application, the proper response is a broad dissemination of selected kinds of processed information to selected public sectors. Regarding computerized water data storage and retrieval systems, it was agreed that a regional data system may not be feasible at this time, but that an exchange of existing program descriptions and subroutines, a degree of standardization of data coding forms, and a cooperative evaluation of existing data systems, would be desirable for coordinated action among the western states.

W77-03166

GROUND-WATER LEVELS IN NEW MEXICO, 1975.

Geological Survey, Albuquerque, N. Mex. Water Resources Div.

For primary bibliographic entry see Field 7C.

W77-03330

EXPERIMENTAL ECOLOGY OF SELECTED VERTEBRATE SPECIES,

Pittsburgh Univ., Pa.

For primary bibliographic entry see Field 6G.

W77-03564

10D. Specialized Information Center Services

PIPING IN EARTH DAMS CONSTRUCTED OF DISPERSIVE CLAY; LITERATURE REVIEW AND DESIGN OF LABORATORY TESTS,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.

For primary bibliographic entry see Field 08D.

W77-03112

1973 WESTERN STATE CONFERENCE ON WATER INFORMATION DISSEMINATION.

Arizona Water Resources Research Center, Tucson.

For primary bibliographic entry see Field 10C.

W77-03166

SUBJECT INDEX

100-YEAR FLOOD

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York, W77-03337 4A

2-

Depth and Frequency of Floods in Illinois, W77-03346 2E

2.4-5-T

Practical Alternatives to 2.4,5-T for Chemical Control of Brush Along Drainage Ditches and General Watershed Use, W77-03168 5G

2.4-D

Practical Alternatives to 2.4,5-T for Chemical Control of Brush Along Drainage Ditches and General Watershed Use, W77-03168 5G

50-YEAR FLOOD

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York, W77-03337 4A

ABSORPTION

Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function, W77-03315 2G

ACCESS ROUTES

Clippinger V Birge (Riparian Rights in an Artificial Lake), W77-03512 6E

Freedom of Beach, W77-03584 6E

ACID MINE WATER

Commonwealth V. Barnes and Tucker Company (Public Nuisance of Acid Mine Drainage), W77-03519 6E

ACIDIC WATER

Precipitation Chemistry Studies at Lake George: Acid Rains, W77-03098 5A

ACREAGE

California Water Project: Law and Politics, W77-03583 6E

ACTIVATED

Intermittent Sand Filtration of Household Wastewater, W77-03452 5D

ACTIVATED CARBON

The Kinetics of Adsorption of Phenols by Granular Activated Carbon, W77-03149 5D

Activated Carbon From Activated Sludge, W77-03425 5D

Sewage Sludge Treatment System, W77-03487 5D

ACTIVATED SLUDGE

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides, W77-03132 5D

A Butane Freezing Process for Dewatering Sludge, W77-03153 5D

System for Dewatering Dilute Slurries, W77-03352 5D

Technical Assistance Project Greeley Wastewater Treatment Facility, Greeley, Colorado. June-July, 1972, W77-03368 5D

Activated Sludge Waste Water Treatment Process - Using Succession of Aerobic and Anaerobic Zones to Remove Nitrogenous Material, W77-03402 5D

Biological Treatment of Sewage Waters - Device with Internal Aeration Zone, W77-03404 5D

Integral Circular Wastewater Treatment Plant, W77-03411 5D

Dorr-Oliver to Market Ecotrol Waste Water Treatment Process, W77-03417 5D

Activated Carbon From Activated Sludge, W77-03425 5D

Design and Control of Nitrifying Activated Sludge Systems, W77-03426 5D

Elemental Distribution Diagrams for Biological Wastewater Treatment, W77-03429 5D

Effluent Variability Estimation for Complete-Mix Activated Sludge Treatment Systems, W77-03434 5D

Correlation Between BOD - TOC - TOD (Zusammenhang Zwischen BSE5 - TOC - TOD), W77-03436 5D

Comparison of Air and Oxygen Activated Sludge Systems, W77-03443 5D

Oxygen and Air Activated Sludge: Another View, W77-03444 5D

Ultraviolet Disinfection: An Alternative to Chlorination, W77-03445 5D

Supernatant Decanting of Aerobically Digested Waste Activated Sludge, W77-03450 5D

Effect of Variable Loading on Oxygen Uptake, W77-03473 5D

Removal of BOD and Nitrogenous Pollutants from Wastewaters, W77-03486 5D

The Cost of Producing Effluents to Varying Standards by Biological Treatment Techniques, W77-03568 5D

Effect of High Dissolved Oxygen Concentration in Activated Sludge Systems, W77-03571 5D

Inhibiting Nitrification in Wastewater Treatment Plants, W77-03573 5D

ACTIVATED SLUDGE PROCESS

Dynamic Response of Final Settling Tanks to Transient Loading Conditions, W77-03156 5D

ADAPTATION

Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*), W77-03203 5C

ADFLUVIAL SALMONIDS

Reproduction by Adfluvial Salmonids in Spawn Creek, Cache County, Utah, W77-03160 2I

ADMINISTRATIVE AGENCIES

Water Pollution, W77-03495 6E

Irrigation and Water Rights, W77-03502 6E

Public Inland Lake Protection and Rehabilitation, W77-03510 6E

Village of Lombard V State Pollution Control Board (Pollution Control Board Without Authority to Impose Regionalization Upon Local Governmental Bodies), W77-03511 6E

Corps' New Look in Flood Control: No Dams, Levees, W77-03593 4A

ADMINISTRATIVE REGULATIONS

Carlson V Village of Worth (Preemption of Local Regulation of Sanitary Landfill by Environmental Protection Act), W77-03497 6E

The Muddy Road to Clean Water, W77-03587 5G

ADMINISTRATIVE REGULATIONS (EPA)

Paint Formulating Point Source Category Effluent Guidelines and Standards, W77-03526 5G

Organic Chemicals Manufacturing Point Source Category-Effluent Limitations and Guidelines (Amendments to Regulations-Butadiene), W77-03528 5G

Proposed Toxic Pollutant Effluent Standards, W77-03529 5G

Marine Sanitation Device Standard, W77-03531 5G

ADOPTION OF PRACTICES

Colorado Water Quality Control Act, W77-03490 6E

ADSORPTION

The Kinetics of Adsorption of Phenols by Granular Activated Carbon, W77-03149 5D

Activated Carbon From Activated Sludge, W77-03425 5D

ADVECTION

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary, W77-03091 2L

Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska, W77-03235 5B

SUBJECT INDEX

AERATION

AERATION

Biological Treatment of Sewage Waters -
Device with Internal Aeration Zone,
W77-03404 5D

Integral Circular Wastewater Treatment Plant,
W77-03411 5D

The Rotor Aerators: Growing Use In U.S.
Waste-Treatment Plants,
W77-03428 5D

Aeration and Oxygen Transfer in Biological
Reactors,
W77-03575 5D

Oxygen Transfer in a 23-Meter Bubble Column,
W77-03579 5D

An Economic Evaluation of Deep Tank Aeration
for Wastewater Treatment,
W77-03580 5D

AERIAL PHOTOGRAPHY

The Aerial Photo-Water Quality Link,
W77-03471 5A

AEROBIC CONDITIONS

Removal of BOD and Nitrogenous Pollutants
from Wastewaters,
W77-03486 5D

AEROBIC DIGESTION

An Operator's Approach to Aerobic Digester
Supernatant Disposal Problems,
W77-03449 5D

AEROBIC TREATMENT

An Operator's Approach to Aerobic Digester
Supernatant Disposal Problems,
W77-03449 5D

Supernatant Decanting of Aerobically Digested
Waste Activated Sludge,
W77-03450 5D

Aeration and Oxygen Transfer in Biological
Reactors,
W77-03575 5D

AEROSOLS

Aerosol Production by Irrigation Equipment
Used for Land Application of Waste Water,
W77-03484 5A

AGRICULTURAL RUNOFF

The Phosphorus Pollution of Waters Due to
Agriculture, (In German),
W77-03134 5B

The Hard Job of Saving Lake Erie,
W77-03534 5G

AGRICULTURAL WATERSHEDS

Simulation of Pesticide Movement on Small
Agricultural Watersheds,
W77-03540 5B

AGRONOMIC CROPS

Determination of Maximum Permissible Levels
of Selected Chemicals that Exert Toxic Effects
on Plants of Economic Importance in Illinois,
W77-03565 5A

AIR

Comparison of Air and Oxygen Activated
Sludge Systems,
W77-03443 5D

Oxygen and Air Activated Sludge: Another
View,
W77-03444 5D

AIR POLLUTION

Relation Between Atmospheric Pollution,
Precipitation, and Streamwater Quality Near A
Large Urban-Industrial Complex,
W77-03097 5B

A Study of the Suspended Particulate Problem
in the Duwamish Basin,
W77-03291 5A

AIR POLLUTION EFFECTS

Determination of Maximum Permissible Levels
of Selected Chemicals that Exert Toxic Effects
on Plants of Economic Importance in Illinois,
W77-03565 5A

ALASKA

Macoma Balthica: An Indicator of Oil Pollution,
W77-03185 5A

Assessment of Potential Interactions of
Microorganisms and Pollutants Resulting from
Petroleum Development on the Outer Continental
Shelf in the Beaufort Sea,
W77-03217 5C

Assessment of Potential Interactions of
Microorganisms and Pollutants Resulting from
Petroleum Development on the Outer Continental
Shelf in the Gulf of Alaska,
W77-03218 5C

Environmental Assessment of Alaskan Waters
- Trace Element Methodology - Inorganic Elements,
W77-03220 5A

Distribution of Light Hydrocarbons, C1-C14, in
the Northeast Gulf of Alaska and the
Southeastern Bering Shelf,
W77-03221 5B

Natural Distribution of Trace Heavy Metals
and Environmental Background in Three
Alaska Shelf Areas,
W77-03222 5B

Baseline Study of Microbial Activity in the
Beaufort Sea and Gulf of Alaska and Analysis
of Crude Oil Degradation by Psychrophilic
Bacteria,
W77-03223 5C

Hydrocarbons: Natural Distribution and
Dynamics on the Alaskan Outer Continental
Shelf,
W77-03224 5B

Microbial Release of Soluble Trace Metals
from Oil Impacted Sediments,
W77-03225 5C

Incidence of Pathology of Marine Fish Diseases
in the Gulf of Alaska, Bering Sea, and
Beaufort Sea,
W77-03226 5B

Development and Operation of HF Current-
Mapping Radar Units-Physical Oceanography,
W77-03227 5B

Current Measurements in the Beaufort Sea,
W77-03228 2L

Effects of Seasonability and Variability of
Streamflow on Nearshore Coastal Areas,
W77-03229 5C

Gulf of Alaska Study of Mesoscale Oceanographic
Processes (Gas-Mop),
W77-03230 6G

Numerical Studies of Alaskan Region,
W77-03231 5B

Bristol Bay Oceanographic Processes (B-BOP),
W77-03232 5B

STD Mappings of the Beaufort Sea Shelf,
W77-03233 2L

Outer Continental Shelf Energy Program,
W77-03234 5B

Preparation of Hydrodynamical-Numerical and
3-Parameter Small-Mesh Atmospheric Models
for Coastal Waters in the Gulf of Alaska,
W77-03235 5B

Mesoscale Currents and Water Masses in the
Gulf of Alaska,
W77-03236 5B

Historical and Statistical Oceanographic Data
Analysis and Ship of Opportunity Program,
W77-03237 5A

Transport of Pollutants in the Vicinity of Prudhoe
Bay, Alaska,
W77-03238 5B

Marine Climatology of the Gulf of Alaska and
the Bering and Beaufort Seas,
W77-03239 5B

Marine Climatology of the Gulf of Alaska and
the Bering and Beaufort Seas. Part III. Climatic
Atlases,
W77-03240 5B

Physical Oceanography of the Gulf of Alaska,
W77-03241 5B

Near-Shore Atmospheric Modification,
W77-03242 5B

A Seismotectonic Study of Seismic and Volcanic
Hazards in the Pribilof Islands - Eastern
Aleutian Islands Region of the Bering Sea,
W77-03243 2L

Coastal Morphology and Sedimentation, Gulf
Coast of Alaska (Glacial Sedimentation),
W77-03244 5B

Coastal Dynamics and Sediment Transportation,
Northeast Gulf of Alaska,
W77-03245 2L

The Environmental Geology and Geomorphology
of the Gulf of Alaska Coastal Plain,
W77-03246 2L

Delineation and Engineering Characteristics of
Permafrost Beneath the Beaufort Sea,
W77-03247 2C

Distribution, Composition and Transport of
Suspended Particulate Matter in the Gulf of
Alaska and Southeastern Bering Shelf,
W77-03248 2L

Offshore Permafrost Studies, Beaufort Sea,
W77-03249 2L

Marine Environmental Problems in the Ice
Covered Beaufort Sea Shelf and Coastal Regions,
W77-03250 2L

Surface Current Observations - Beaufort Sea,
1972,
W77-03251 2L

Distribution and Character of Icings in
Northeastern Alaska,
W77-03252 2C

SUBJECT INDEX

ANALYTICAL TECHNIQUES

A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs, W77-03253 5B

Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L

Yukon Delta Coastal Processes Study, W77-03255 2L

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L

Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska, W77-03258 2L

Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska, W77-03259 2L

Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

Beaufort Seacoast Permafrost Studies, W77-03262 2C

Benthos-Sedimentary Substrate Interactions, W77-03263 5C

Faulting and Instability of Shelf Sediments - Western Gulf of Alaska, W77-03264 2L

A Historical Summary of Earthquake Epicenters in and Near Alaska, W77-03265 7C

A Study of Beaufort Sea Coastal Erosion - Northern Alaska, W77-03266 2L

Dynamics of Near-Shore Ice, W77-03268 2C

Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C

Study of Climatic Effects on Fast Ice Extent and its Seasonal Decay Along the Beaufort Sea Coast, W77-03270 2C

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L

Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03272 2C

Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03273 2C

Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures, W77-03274 2C

Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study, W77-03275 2C

Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice, W77-03276 2C

Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies, W77-03277 7B

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

Breakup Flooding and Nutrient Source of Colville River Delta During 1973, W77-03388 5B

ALFALFA
Effect of Water Stress on the Phasic Development of Annual Medicago Species, W77-03136 2I

ALGAE
A Study on the Application of Biogrowth Sheets to Improve Lagoon Effluent Quality, W77-03162 5D

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

Organic Phosphorus in Lakes, W77-03210 5C

The Hard Job of Saving Lake Erie, W77-03534 5G

ALGAL CONTROL
A Study on the Application of Biogrowth Sheets to Improve Lagoon Effluent Quality, W77-03162 5D

ALGAL GROWTH
A Study on the Application of Biogrowth Sheets to Improve Lagoon Effluent Quality, W77-03162 5D

ALGAL POISONING
Toxicity of Ammonia to Algae in Sewage Oxidation Ponds, W77-03413 5D

ALGAL TOXINS
Toxicity of Ammonia to Algae in Sewage Oxidation Ponds, W77-03413 5D

ALKYLATE DETERGENTS
The Effect of Detergents on Larval Development of a Crab, W77-03189 5C

ALKYLBENZOLSULFATES
Experimental Substantiation of the Maximal Permissible Concentrations of Triethanolamine, Ammonium and Calcium Salts of Alkylbenzenesulfates in Water Bodies, (In Russian), W77-03586 5B

ALLATOONA LAKE (GEO)
Allatoona Lake, Destratification Equipment Test Report, W77-03306 5G

Allatoona Lake, Destratification Equipment Test, Appendix A, Operational and Water Quality Data, 1968, W77-03307 5G

Allatoona Lake, Destratification Equipment Test, Appendix B, Operational and Water Quality Data, 1969, W77-03308 5G

Allatoona Lake, Destratification Equipment Test, Appendix C, Operational and Water Quality Data, 1970, W77-03309 5G

Allatoona Lake, Destratification Equipment Test, Appendix D, Effects of Artificial Destratification on Temperature and Dissolved Oxygen in Allatoona Reservoir, W77-03310 5G

ALLOTMENTS
Report on Tenth Annual Water Resources Research Conference, Sponsored by Office of Water Research and Technology, April 9-10, 1975, W77-03206 9D

ALLUVIAL AQUIFERS
Hydrogeology of the Missouri River Flood Plain near Glasgow, Missouri, W77-03164 2F

ALTERNATIVE COSTS
User Oriented Systems Analysis for Regional Municipal Water Supply Planning, W77-03159 6A

ALTERNATIVE PLANNING
Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I, W77-03288 6E

ALUMINUM HYDROXIDE
Organic Phosphorus in Lakes, W77-03210 5C

AMERICAN RIVER DRAINAGE BASIN
Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume III - Operational Design, Final Report, W77-03215 3B

AMMONIA
Ammonia Removal from Wastewater by Ligand Exchange, W77-03367 5D

Toxicity of Ammonia to Algae in Sewage Oxidation Ponds, W77-03413 5D

ANAEROBIC CONDITIONS
Removal of BOD and Nitrogenous Pollutants from Wastewaters, W77-03486 5D

ANAEROBIC DIGESTION
Biochemical Mechanisms in the Methane Fermentation of Glutamic and Oleic Acids, W77-03441 5D

ANALYTICAL TECHNIQUES
Elemental Distribution Diagrams for Biological Wastewater Treatment, W77-03429 5D

ANALYTICAL TECHNIQUES
Quadratic Finite Elements in Shallow Water Problems, W77-03083 8B

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*, W77-03184 5C

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples, W77-03202 5A

SUBJECT INDEX

ANALYTICAL TECHNIQUES

Measurement of Nonexchanging Pores During Miscible Displacement in Soils, W77-03320 2G

Lake Phosphorus Loading Graphs: An Alternative, W77-03377 5C

Cyanophage Analysis as a Biological Pollution Indicator-Bacterial and Viral, W77-03460 5A

Use of Intrinsically Safe Instrumentation, W77-03462 5A

Investigations on the Importance of the Organic Chloro-Compounds and their Adsorbability (Untersuchungen Zur Bedeutung der Organischen Chlorverbindungen und Ihrer Adsorbierbarkeit), W77-03465 5A

A New Method of Automatic Determination of Nitrate in Waste Waters and Polluted Surface Waters (Ein Neues Verfahren Zur Automatischen Nitrat-Bestimmung in Abwaessern und Belasteten Oberflaechenwaessern), W77-03466 5A

Nitrate Monitoring, W77-03468 5A

The Aerial Photo-Water Quality Link, W77-03471 5A

The Limitation of the Ratio of Fecal Coliforms to Total Coliphage as a Water Pollution Index, W77-03472 5A

Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water, W77-03474 5A

Investigation of Oxygen Transfer to Slime as a Surface Reaction, W77-03476 5B

Useful Modeling Concepts for the FCD Water System, W77-03524 6A

ANEMOMETERS

Electronic Sensor for Low-to-Medium Windspeeds, W77-03099 7B

ANESTHETICS

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (Salmo Gairdneri), W77-03204 5C

ANIMAL BEHAVIOR

Effects of Oil Pollution on Breeding Grey Seals, W77-03187 5C

Effect of Temperature and Salinity on Extension of Siphons by Mercenaria Mercenaria, W77-03205 5C

ANIMAL PHYSIOLOGY

Effect of Temperature and Salinity on Extension of Siphons by Mercenaria Mercenaria, W77-03205 5C

ANIMAS RIVER (NM)

Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico, W77-03176 4A

ANION EXCHANGE

Studies on a Mechanism for Salt Rejection in Reverse Osmosis Membranes as a Guide to Improved Materials for Desalination of Sea Water, W77-03290 3A

ANTARCTIC

Radio-Echo Layers and the Recent Stability of the West Antarctic Ice Sheet, W77-03100 2C

ANTELOPE CREEK (NB)

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume II, Summary Report, Antelope Creek, Dead Mans Run, and Middle Creek, Salt Creek Basin, W77-03180 4A

ANTITRANSPIRANTS

The Regulation of Transpiration Expenditure of Moisture by Plants with the Aid of Antitranspirants, (In Russian), W77-03475 3B

APALACHICOLA BAY (FLA)

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida, W77-03304 2L

APPROPRIATION

Suspension and Restoration of Right to Appropriate, W77-03508 6E

Cache La Poudre Water Users Association V Glacier View Meadows (Appropriation of Water in Plan of Augmentation), W77-03520 6E

AQUATIC POPULATIONS

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

AQUATIC PRODUCTIVITY

Methods of Dissolved Oxygen Budget Analysis for Assessing Effects of Dredged Material Disposal on Biological Community Metabolism, W77-03393 5C

AQUEDUCTS

The California State Water Project in 1975, W77-03551 6B

AQUEOUS SOLUTIONS

Photolysis of 5-Chlorouracil in Natural Waters, W77-03477 5B

AQUICULTURE

Northwest Mariculture Laws, W77-03598 6E

AQUIFER CHARACTERISTICS

Measured and Simulated Ground-Water Levels in the Franklin Area, Southeastern Virginia, W77-03326 7C

Hydraulic Characteristics of the Piney Point Aquifer and Overlying Confining Bed Near Dover, Delaware, W77-03331 2F

Buried Aquifers in the Brooten-Belgrade and Lake Emily Areas, West-Central Minnesota--Factors Related to Developing Water for Irrigation, W77-03335 4B

Appraisal of Water Resources in the Hackensack River Basin, New Jersey, W77-03336 2F

Summary of Geology and Ground-Water Resources of Passaic County, New Jersey, W77-03345 4B

Ground-Water Resources of Greeley and Wichita Counties, Western Kansas, W77-03347 4B

AQUIFER MANAGEMENT

Ground Water Basin Protection Projects: Fremont Salinity Barrier, W77-03555 4B

AQUIFERS

A Three-Dimensional Finite Element Ground Water Model, W77-03109 2F

Permeability and Ground Water Circulation in the Madison Aquifer Along the Eastern Flank of the Bighorn Mountains of Wyoming, W77-03122 2F

Ground-Water Quality Data for Georgia, W77-03333 7C

High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida, W77-03344 7B

ARAL SEA

Precipitation on the Aral Sea Surface, (In Russian), W77-03592 2B

ARCTIC

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

ARCTIC COASTAL PLAINS (ALASKA)

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

ARCTIC OCEAN

STD Mappings of the Beaufort Sea Shelf, W77-03233 2L

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska, W77-03238 5B

A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs, W77-03253 5B

The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C

Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L

ARIZONA

The Occurrence of Groundwater in the Satpura Region of Central India, W77-03146 4B

The Relationship of Bottom Sediments to Bacterial Water Quality in a Recreational Swimming Area, W77-03167 5B

Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Coun-

SUBJECT INDEX

BARRIER ISLANDS

ties, Arizona, and in Hidalgo County, New Mexico-1975, W77-03327 7C

Maps Showing Ground-Water Conditions in the San Bernardino Valley Area Cochise County, Arizona--1975, W77-03328 7C

Rights to Water. W77-03494 6E

Water Pollution. W77-03495 6E

ARMY AMMUNITION PLANT (IOWA)

Aquatic Field Survey at Iowa Army Ammunition Plant, W77-03386 5C

ARMY CORPS OF ENGINEERS

Corps' New Look in Flood Control: No Dams, Levees, W77-03593 4A

AROMATIC COMPOUNDS

Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons, W77-03219 5A

ARSENIC

Determination of Arsenic in Drinking Water by Means of Silver Diethyldithiocarbamate, (In Russian), W77-03113 5A

ARSENIC COMPOUNDS

Determination of Arsenic in Drinking Water by Means of Silver Diethyldithiocarbamate, (In Russian), W77-03113 5A

ARTIFICIAL AERATION

Eutrophication and Restoration of Lakes Receiving Nutrients from Diffuse Sources Only, W77-03536 5C

ARTIFICIAL LAKES

Clipping V Birge (Riparian Rights in an Artificial Lake), W77-03512 6E

ASBESTOS

The People's Lake, W77-03594 5G

ASIATIC CLAMS

Effects of Potassium on Adult Asiatic Clams, *Corbicula Manilensis*, W77-03119 5C

ASPHALTS

Plastic-Reinforced Asphalt Seepage Barrier, W77-03120 3B

ASSATEAGUE ISLAND

Assateague Ecological Studies, W77-03381 5C

ATLANTIC OCEAN

Current Structure and Mixing in the Shelf/Slope Water Front South of New England, W77-03087 2L

Eddy Kinetic Energy in the Deep Western North Atlantic, W77-03088 2L

The Bottom Boundary Layer of the Deep Ocean, W77-03089 2L

High-Wave Conditions Observed Over the North Atlantic in September 1961, W77-03090 2L

Nature and Genesis of Some Storm Washover Deposits, W77-03293 2L

Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States, W77-03332 2L

ATMOSPHERIC DATA

Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C

ATMOSPHERIC MODELS

Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska, W77-03235 5B

ATTITUDES

An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report, W77-03157 6B

AUSTRALIA

Piping in Earth Dams Constructed of Dispersive Clay: Literature Review and Design of Laboratory Tests, W77-03112 8D

Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment, W77-03188 5B

Water Resources of Australia and the Pattern of Population Concentrations, W77-03278 6D

The Composition of Rainwater at Two Sites Near Townsville, Qld. (Australia), W77-03279 2K

Aspects of the Chemical Variability of some Tasmanian Inland Waters (Australia), W77-03283 2K

Chemistry of Salt Lakes and Other Waters in the Sub-Humid Regions of Tasmania (Australia), W77-03284 2H

Stability of Ionic Proportions in Five Salt Lakes in Victoria, Australia, W77-03285 2H

Chemical Composition of Some Inland Surface Waters in South, Western, and Northern Australia, W77-03286 2K

Wind-Induced Water Level Oscillations in Shallow Lagoons, W77-03287 2H

AUTOMATIC CONTROL

Automation: A Short History, But a Long Future, W77-03469 5D

AUTOMATION

A New Method of Automatic Determination of Nitrate in Waste Waters and Polluted Surface Waters (Ein Neues Verfahren Zur Auto-

matischen Nitrat-Bestimmung in Abwaessern und Belasteten Oberflaechenwaessern), W77-03466 5A

Automation: A Short History, But a Long Future, W77-03469 5D

BACTERIA

Sanitary-Bacteriological Study of the Effectiveness of Decontaminating the Sewage of Voroshilovgrad on Sewage Farms, (In Russian), W77-03128 5D

Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French), W77-03144 5C

The Relationship of Bottom Sediments to Bacterial Water Quality in a Recreational Swimming Area, W77-03167 5B

Chlorine Disinfection of Treated Wastewater in a Baffled Contact Chamber at Less Than 1 C, W77-03363 5D

Behaviour in Conventional Sewage Purification Processes of Coliform Bacteria with Transferable or Non-Transferable Drug-Resistance, W77-03435 5D

BACTERIAL REMOVAL

Virus and Bacterial Removal from Waste Water by Land Treatment, W77-03447 5D

BACTERICIDES

The Influence of Carbon-Nitrogen Ratio on the Chlorination of Microbial Aggregates, W77-03414 5D

BACTERIOLOGICAL POLLUTIONS

The Relationship of Bottom Sediments to Bacterial Water Quality in a Recreational Swimming Area, W77-03167 5B

BACTERIOPHAGE

The Application of the Foam Fractionation Process to the Removal of Viruses. Part I. The Production of a Mathematical Model to Predict the Efficiency of Virus Removal, W77-03433 5D

The Limitation of the Ratio of Fecal Coliforms to Total Coliphage as a Water Pollution Index, W77-03472 5A

BANK EROSION

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire, W77-03177 4A

BARLEY

Effects of Soil-Moisture Regimes on the Growth of Barley, W77-03216 3F

BARNACLES

Effects of Oil on Beaches in West Cork, Ireland, W77-03192 5C

BARRIER ISLANDS

Assateague Ecological Studies, W77-03381 5C

SUBJECT INDEX

BARRIERS

BARRIERS

- Plastic-Reinforced Asphalt Seepage Barrier, W77-03120 3B
- Poisoning of, and Obstruction to, Fish. W77-03500 6E

BASE FLOW

- Normal-Mode Analysis of the Structure of Baseflow Recession Curves, W77-03313 2F

BASE FLOW RECESSION

- Normal-Mode Analysis of the Structure of Baseflow Recession Curves, W77-03313 2F

BASE FLOW SEPARATION

- Normal-Mode Analysis of the Structure of Baseflow Recession Curves, W77-03313 2F

BASELINE DATA

- Near-Shore Atmospheric Modification, W77-03242 5B
- Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03272 2C

BASELINE STUDIES

- Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea, W77-03217 5C
- Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska, W77-03218 5C
- Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons, W77-03219 5A
- Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A
- Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B
- Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas, W77-03222 5B
- Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C
- Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf, W77-03224 5B
- Microbial Release of Soluble Trace Metals from Oil Impacted Sediments, W77-03225 5C

- Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea, W77-03226 5B

- Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography, W77-03227 5B

- Current Measurements in the Beaufort Sea, W77-03228 2L

- Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas, W77-03229 5C

- Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

- Numerical Studies of Alaskan Region, W77-03231 5B

- Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B

- STD Mappings of the Beaufort Sea Shelf, W77-03233 2L

- Outer Continental Shelf Energy Program, W77-03234 5B

- Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska, W77-03235 5B

- Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B

- Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program, W77-03237 5A

- Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska, W77-03238 5B

- Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas, W77-03239 5B

- Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases, W77-03240 5B

- Physical Oceanography of the Gulf of Alaska, W77-03241 5B

- Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B

- The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain, W77-03246 2L

- Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

- Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf, W77-03248 2L

- Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L

- Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L

- Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L

- Distribution and Character of Icings in Northeastern Alaska, W77-03252 2C

- A 'Herring-Bone' Pattern of Possible Taylor-Gorter-Type Flow Origin Seen in Sonographs, W77-03253 5B

- Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L

- Yukon Delta Coastal Processes Study, W77-03255 2L

- Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L

- Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L

- Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska, W77-03258 2L

- Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska, W77-03259 2L

- Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

- Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

- Beaufort Seacoast Permafrost Studies, W77-03262 2C

- Benthos-Sedimentary Substrate Interactions, W77-03263 5C

- Faulting and Instability of Shelf Sediments - Western Gulf of Alaska, W77-03264 2L

- A Historical Summary of Earthquake Epicenters in and Near Alaska, W77-03265 7C

- A Study of Beaufort Sea Coastal Erosion - Northern Alaska, W77-03266 2L

- The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C

- Dynamics of Near-Shore Ice, W77-03268 2C

- Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C

- Study of Climatic Effects on Fast Ice Extent and its Seasonal Decay Along the Beaufort Sea Coast, W77-03270 2C

- Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L

- Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03273 2C

SUBJECT INDEX

BIOASSAY

Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures, W77-03274 2C

Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study, W77-03275 2C

Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice, W77-03276 2C

Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies, W77-03277 7B

BASELINE STUDIES

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

BASIC DATA COLLECTIONS

Allatoona Lake, Destratification Equipment Test, Appendix A, Operational and Water Quality Data, 1968, W77-03307 5G

Allatoona Lake, Destratification Equipment Test, Appendix B, Operational and Water Quality Data, 1969, W77-03308 5G

Allatoona Lake, Destratification Equipment Test, Appendix C, Operational and Water Quality Data, 1970, W77-03309 5G

BATHYMETRY

Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska, W77-03245 2L

BAYS

Surf-Zone Water Quality in Liverpool Bay, W77-03092 5B

Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography, W77-03358 5B

BEACH EROSION

Beach Processes, Perrien County, Michigan, W77-03095 2J

Nature and Genesis of Some Storm Washover Deposits, W77-03293 2L

A Cine-Camera Technique for Process Measurement on a Ridge and Runnel Beach, W77-03325 2L

BEACHES

Relationships Between Sand Input from Rivers and the Composition of Sands from the Beaches of Southern California, W77-03324 2L

A Cine-Camera Technique for Process Measurement on a Ridge and Runnel Beach, W77-03325 2L

Freedom of Beach, W77-03584 6E

BEAR RIVER BASIN (IDAHO)

Bear River Evaluation Report, 1974 Survey, W77-03292 5B

BEAUFORT SEA

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L

Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L

Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L

Beaufort Seacoast Permafrost Studies, W77-03262 2C

A Study of Beaufort Sea Coastal Erosion - Northern Alaska, W77-03266 2L

Study of Climatic Effects on Fast Ice Extent and its Seasonal Decay Along the Beaufort Sea Coast, W77-03270 2C

Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03273 2C

Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study, W77-03275 2C

BED FORMS

A Cine-Camera Technique for Process Measurement on a Ridge and Runnel Beach, W77-03325 2L

BEDS UNDER WATER

Flow and Bed Topography in Curved Open Channels, W77-03084 8B

BELANGER'S EQUATION

Exact Solution of Gradually Varied Flow, W77-03085 8B

BELORUSSIAN-SSR

Significance of Nitrates in Drinking Water, (In Russian), W77-03541 5B

BENEFICIAL USE

General Basis of Water Rights in Utah, W77-03504 6E

Talley V Carley (Priorities to Water in 1963 Amendment to 82 Oklahoma Statutes Annotated Section 1-A), W77-03521 6E

BENTHIC FAUNA

Toxicity of Crude Oils and a Dispersant to the Stony Coral *Madracis Mirabilis*, W77-03196 5C

BENTHIC ORGANISM

Macoma Balthica: An Indicator of Oil Pollution, W77-03185 5A

BENTHOS

Benthos-Sedimentary Substrate Interactions, W77-03263 5C

A Review of Clustering Techniques with Emphasis on Benthic Ecology, W77-03372 5A

BENZOPYRENE

Permissible Level of Benzo(A)Plyrene in Water Bodies, (In Russian), W77-03117 5B

BERING SEA

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas, W77-03239 5B

Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf, W77-03248 2L

Benthos-Sedimentary Substrate Interactions, W77-03263 5C

Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03272 2C

BIBLIOGRAPHIES

Publications List of the Idaho Water Resources Research Institute, W77-03154 10C

Experimental Ecology of Selected Vertebrate Species, W77-03564 6G

BIGHORN MOUNTAIN RANGE (WYO)

Permeability and Ground Water Circulation in the Madison Aquifer Along the Eastern Flank of the Bighorn Mountains of Wyoming, W77-03122 2F

BIOACCUMULATION

Degradation Mechanisms: Controlling the Bioaccumulation of Hazardous Materials, W77-03391 5B

BIOASSAY

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*, W77-03184 5C

Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp, W77-03186 5C

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory, W77-03197 5C

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*), W77-03204 5C

BIOASSAY

The Effect of Detergents on Larval Development of a Crab, W77-03189 5C

SUBJECT INDEX

BIOCHEMICAL OXYGEN DEMAND

BIOCHEMICAL OXYGEN DEMAND

Technical Assistance Project Greeley Waste-water Treatment Facility, Greeley, Colorado. June-July, 1972, W77-03368 5D

Dorr-Oliver to Market Ecolotrol Waste Water Treatment Process. W77-03417 5D

Concentric Waste-Treatment Plant Saves Land, Cuts Cost. W77-03427 5D

U. S. Air Force Greens Colorado. W77-03431 5D

Correlation Between BOD - TOC - TOD (Zusammenhang Zwischen BSE5 - TOC - TOD). W77-03436 5D

Comparison of Air and Oxygen Activated Sludge Systems. W77-03443 5D

Flow Equalization by Use of Aeration Tank Volume. W77-03446 5D

An Operator's Approach to Aerobic Digester Supernatant Disposal Problems. W77-03449 5D

Intermittent Sand Filtration of Household Wastewater. W77-03452 5D

The Electrolytic Respirometer - I. Factors Affecting Oxygen Uptake Measurements. W77-03457 5A

Removal of BOD and Nitrogenous Pollutants from Wastewaters. W77-03486 5D

Secondary Treatment Information; Biochemical Oxygen Demand, Suspended Solids and pH. W77-03530 5G

The Cost of Producing Effluents to Varying Standards by Biological Treatment Techniques. W77-03568 5D

Effect of High Dissolved Oxygen Concentration in Activated Sludge Systems. W77-03571 5D

Inhibiting Nitrification in Wastewater Treatment Plants. W77-03573 5D

BIODEGRADATION

Degradation Mechanisms: Controlling the Bioaccumulation of Hazardous Materials. W77-03391 5B

Biological Converter for Faecal Matter in Water - Using Rotary Tubes With Fibrous Filling Supporting the Bacterial Culture. W77-03409 5D

BIOFILM REACTORS

A Study of Substrate Removal in a Microbial Film Reactor. W77-03480 5D

BIOGENIC SOURCES

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf. W77-03221 5B

BIOGROWTH PARTITIONS

A Study on the Application of Biogrowth Sheets to Improve Lagoon Effluent Quality. W77-03162 5D

BIOINDICATORS

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*. W77-03184 5C

Macoma Balthica: An Indicator of Oil Pollution. W77-03185 5A

Mussel Test for Biological Control of Water Pollution (Kagyo-teszt vizszenyezések biologiai hatasanak vizsgalatara). W77-03454 5A

BIOLOGICAL COMMUNITIES

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada. W77-03199 5C

BIOLOGICAL DAMAGE

The Effect of Oil Pollution in Bantry Bay. W77-03194 5C

BIOLOGICAL FILTERS

Laboratory Studies on the Effects of Temperature on Accumulation of Solids in Biological Filters. W77-03464 5D

BIOLOGICAL PROPERTIES

Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification. W77-03208 2H

Data on Selected Lakes in Washington, Part 5. W77-03350 7C

BIOLOGICAL REACTORS

Aeration and Oxygen Transfer in Biological Reactors. W77-03575 5D

BIOLOGICAL TREATMENT

The Rotating Biological Filter. W77-03282 5D

Advanced Trickling Filter for Wastewater Treatment. W77-03365 5D

Biological Purification of Sewage Water-In a Multi-Stage Treatment Tank With Rotating Contactor Surfaces Partly Immersed in the Liquid. W77-03407 5D

Biological Converter for Faecal Matter in Water - Using Rotary Tubes With Fibrous Filling Supporting the Bacterial Culture. W77-03409 5D

Dorr-Oliver to Market Ecolotrol Waste Water Treatment Process. W77-03417 5D

Activated Carbon From Activated Sludge. W77-03425 5D

Elemental Distribution Diagrams for Biological Wastewater Treatment. W77-03429 5D

Effluent Variability Estimation for Complete-Mix Activated Sludge Treatment Systems. W77-03434 5D

Behaviour in Conventional Sewage Purification Processes of Coliform Bacteria with Transferable or Non-Transferable Drug-Resistance. W77-03435 5D

Large Scale Sewage Treatment Plant with Sludge Incinerator. W77-03442 5D

Comparison of Air and Oxygen Activated Sludge Systems. W77-03443 5D

Flow Equalization by Use of Aeration Tank Volume. W77-03446 5D

Tertiary Treatment of Sewage Effluents. W77-03453 5D

Comparative Assessment of the Effectiveness of Certain Methods Making Industrial Effluents Noncarcinogenic. (In Russian). W77-03488 5D

The Cost of Producing Effluents to Varying Standards by Biological Treatment Techniques. W77-03568 5D

Sodium Bicarbonate Neutralizes. W77-03570 5D

Inhibiting Nitrification in Wastewater Treatment Plants. W77-03573 5D

Aeration and Oxygen Transfer in Biological Reactors. W77-03575 5D

BIOMASS

Seasonal Interactions Among Estuarine Primary Producers and Herbivores. W77-03387 2L

BIRDS

Litter and Oil on the Shores of Utsira, Rogaland County, During Autumn 1974. (In Danish). W77-03125 5B

BIVALVE MOLLUSCS

Macoma Balthica: An Indicator of Oil Pollution. W77-03185 5A

BLACK CRAPPIE

Distribution and Feeding of Pumpkinseed (*Lepomis gibbosus*) and Black Crappie (*Pomoxis nigromaculatus*) in a power plant cooling lake. W77-03078 5C

BLACK CREEK (IND)

Environmental Impact of Land Use on Water Quality. Progress Report. W77-03106 5G

BLUFF EROSION

The Illinois Coastal Zone Management Program: First Year Work Product. Volume II. Coastal Geological Studies. W77-03103 2H

BLUFFS

The Illinois Coastal Zone Management Program: First Year Work Product. Volume II. Coastal Geological Studies. W77-03103 2H

BOTTOM BOUNDARY LAYER

The Bottom Boundary Layer of the Deep Ocean. W77-03089 2L

SUBJECT INDEX

CATALYTIC OXIDATION

BOTTOM SEDIMENTS

The Relationship of Bottom Sediments to Bacterial Water Quality in a Recreational Swimming Area, W77-03167 5B

Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment, W77-03188 5B

Benthos-Sedimentary Substrate Interactions, W77-03263 5C

BOUNDARIES (SURFACES)

Cavitation From Surface Irregularities in High Velocity, W77-03082 8B

BOUNDARY CONDITIONS

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

BOUNDARY LAYERS

The Bottom Boundary Layer of the Deep Ocean, W77-03089 2L

BRACHYSYNODONTIS-BATENSODA

Growth, Mortality and Production of Brachysynodontis Batensoda (Pisces, Mochocidae) in the Southeastern Archipelago of Lake Tchad, (In French), W77-03597 2H

BREAKWATERS

Effects of a Breakwater on Nearshore Currents Due to Breaking Waves, W77-03297 8B

BRIDGE DESIGN

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York, W77-03337 4A

BRIDGES

Scour Around Bridge Piers, W77-03294 8B

BRISTOL BAY

Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B

BRUSH CONTROL

Practical Alternatives to 2,4,5-T for Chemical Control of Brush Along Drainage Ditches and General Watershed Use, W77-03168 5G

BUTANE FREEZING PROCESS

A Butane Freezing Process for Dewatering Sludge, W77-03153 5D

BUTYLAMINES

Hygienic Standardization of the Content in Water of Monoisobutylamine and Diisobutylamine During their Combined Action, (In Russian), W77-03481 5B

CALCIUM

Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in Anodonta Cygnea, (In Russian), W77-03366 5C

CALCIUM SLUDGE

Liming Farmland with Calcium Sludge, W77-03163 5D

CALIBRATIONS

Calibration of Neutron Probe in Some Selected Hawaiian Soils, W77-03321 2G

CALIFORNIA

A Three-Dimensional Finite Element Ground Water Model, W77-03109 2F

Land Based Sewage Sludge Management Alternatives for Los Angeles: Evaluation and Comparison, W77-03289 5D

Relationships Between Sand Input from Rivers and the Composition of Sands from the Beaches of Southern California, W77-03324 2L

Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California, W77-03342 2K

Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California, W77-03348 7C

Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices, W77-03351 5A

The Cost of Coastal Zoning, W77-03535 6E

Feasibility of Transplantation, Revegetation, and Restoration of Eelgrass in San Diego Bay, California, W77-03546 5G

California's Ground Water, W77-03548 4B

Urban Water Use in California, W77-03549 6B

Plan for Improvement of the Delta Levees, W77-03550 4A

The California State Water Project in 1975, W77-03551 6B

Vegetative Water Use in California, 1974, W77-03554 3F

Hurdles in the Path of Coastal Plan Implementation, W77-03582 6B

California Water Project: Law and Politics, W77-03583 6E

CALUMET RIVER (ILL-IND)

Water Quality in the Calumet Area. Conference on Pollution of Lower Lake Michigan, Calumet River, Grand Calumet River, Little Calumet River, and Wolf Lake, Illinois and Indiana, W77-03382 5B

CANADA

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary, W77-03091 2L

Coastal Region Residence Time Estimates from Concentration Gradients, W77-03093 5C

Undrained Behavior of Embankments on New Liskeard Varved Clay, W77-03108 8D

Retransmission of Hydrometric Data in Canada, W77-03111 7B

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

Precautions to be Taken in the Construction and Maintenance of Water Supply and Sewer Systems (Precautions a Prendre Dans La Construction Et L'Entretien Des Reseaux D' Aqueduc Et D' Egout), W77-03400 8G

Monitoring of Community Water Supplies, W77-03463 5A

The Legal Framework for Public Participation in Canadian Water Management, W77-03543 6E

CANALS

Hydrology and Environmental Aspects of Erie Canal (1817-99), W77-03334 8B

CANNERIES

Investigation of the Physical Feasibility of Mobile Fish Processing Plants, W77-03558 6B

CANYON LAKE (ARIZ)

The Relationship of Bottom Sediments to Bacterial Water Quality in a Recreational Swimming Area, W77-03167 5B

CAPITAL COSTS

The Cost of Producing Effluents to Varying Standards by Biological Treatment Techniques, W77-03568 5D

CARBON

Ecology of Aquatic Saprophytic Phycocyanes. II, (In Russian), W77-03201 5C

Factors Affecting Powdered Carbon Treatment of a Municipal Wastewater, W77-03430 5D

CARBON 14

The Primary Production of Lake Sibaya, KwaZulu, South Africa, W77-03376 5C

CARBON TREATMENT

Factors Affecting Powdered Carbon Treatment of a Municipal Wastewater, W77-03430 5D

CARCINOGENS

Preliminary Assessment of Suspected Carcinogens in Drinking Water: Report to Congress, W77-03360 5A

CATALYSTS

An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D

CATALYTIC OXIDATION

An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D

SUBJECT INDEX

CAVITATION

CAVITATION

Cavitation From Surface Irregularities in High Velocity,
W77-03082 8B

CAVITATION DAMAGE

Cavitation From Surface Irregularities in High Velocity,
W77-03082 8B

CELLULOSE ACETATE MEMBRANES

Studies on a Mechanism for Salt Rejection in Reverse Osmosis Membranes as a Guide to Improved Materials for Desalination of Sea Water.
W77-03290 3A

CENSUS

Assateague Ecological Studies.
W77-03381 5C

Idaho Environmental Overview,
W77-03557 6G

CENTRIFUGATION

Centrifuge for Dewatering Sewage Sludge.
W77-03410 5D

CHANNEL ENLARGEMENT

The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England,
W77-03314 4C

CHANNEL FLOW

Waterway Districts.
W77-03516 6E

CHANNEL MORPHOLOGY

The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England,
W77-03314 4C

CHANNELS

Quadratic Finite Elements in Shallow Water Problems,
W77-03083 8B

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire.
W77-03177 4A

Experimental Investigation of Flow Over Side Weirs,
W77-03317 8B

CHARLES RABOTS BRE GLACIER

Structure of the Glacier Charles Rabots Bre, Norway,
W77-03311 2C

CHEMCONTROL

Practical Alternatives to 2,4,5-T for Chemical Control of Brush Along Drainage Ditches and General Watershed Use,
W77-03168 5G

CHEMICAL ANALYSIS

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples,
W77-03202 5A

Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons,
W77-03219 5A

Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements,
W77-03220 5A

Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California.
W77-03342 2K

Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968 - January 1975,
W77-03343 5A

CHEMICAL DISPERSANT

Influence of Illumination on Phytotoxicity of Crude Oil,
W77-03193 5C

CHEMICAL INDUSTRY

Organic Chemicals Manufacturing Point Source Category-Effluent Limitations and Guidelines (Amendments to Regulations-Butadiene).
W77-03528 5G

CHEMICAL INTERACTIONS

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (Salmo Gairdneri),
W77-03204 5C

CHEMICAL OXYGEN DEMAND

Correlation Between BOD - TOC - TOD (Zusammenhang Zwischen BSE5 - TOC - TOD),
W77-03436 5D

Intermittent Sand Filtration of Household Wastewater,
W77-03452 5D

A Study of Substrate Removal in a Microbial Film Reactor,
W77-03480 5D

Inhibiting Nitrification in Wastewater Treatment Plants,
W77-03573 5D

CHEMICAL PROPERTIES

Data on Selected Lakes in Washington, Part 5,
W77-03350 7C

CHEMICAL REACTIONS

Photolysis of 5-Chlorouracil in Natural Waters,
W77-03477 5B

CHEMICAL TREATMENT

Comparative Assessment of the Effectiveness of Certain Methods Making Industrial Effluents Noncarcinogenic, (In Russian),
W77-03488 5D

CHEMICAL WASTES

Aquatic Field Survey at Iowa Army Ammunition Plant,
W77-03386 5C

Organic Chemicals Manufacturing Point Source Category-Effluent Limitations and Guidelines (Amendments to Regulations-Butadiene).
W77-03528 5G

Those Nasty Phosphatic Clay Ponds,
W77-03596 5G

CHEMICALS

Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois,
W77-03565 5A

CHEMISTRY OF PRECIPITATION

Precipitation Chemistry Studies at Lake George: Acid Rains,
W77-03098 5A

CHESAPEAKE BAY

Seasonal Interactions Among Estuarine Primary Producers and Herbivores,
W77-03387 2L

A Model for the Control of Dissolved Manganese in the Interstitial Waters of Chesapeake Bay,
W77-03556 5B

CHICOPEE RIVER (MA)

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts.
W77-03178 4A

CHILE

Phytoplankton Ecology in Valparaiso Bay: III. Phytoplankton from 1972-73, (In Spanish),
W77-03200 5C

CHINCOTEAGUE BAY

Assateague Ecological Studies.
W77-03381 5C

CHLORINATION

Chlorine Disinfection of Treated Wastewater in a Baffled Contact Chamber at Less Than 1 C,
W77-03363 5D

The Influence of Carbon-Nitrogen Ratio on the Chlorination of Microbial Aggregates,
W77-03414 5D

Model Studies in Aqueous Chlorination: The Chlorination of Phenols in Dilute Aqueous Solutions,
W77-03458 5A

Effect of Water Chlorination Upon Levels of Some Polynuclear Aromatic Hydrocarbons in Water,
W77-03459 5F

CHLORINE

Chlorine Disinfection of Treated Wastewater in a Baffled Contact Chamber at Less Than 1 C,
W77-03363 5D

Decontamination of Water Contaminated with Polycyclic Aromatic Hydrocarbons (PAH). I. Action of Chlorine and Ozone on PAH Dissolved in Doubly Distilled and in De-Ionized Water,
W77-03369 5D

Investigations on the Importance of the Organic Chloro-Compounds and their Adsorbability (Untersuchungen Zur Bedeutung der Organischen Chlorverbindungen und Ihrer Adsorbierbarkeit),
W77-03465 5A

CHLOROURACIL

Photolysis of 5-Chlorouracil in Natural Waters,
W77-03477 5B

CHUKCHI SEA

Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study,
W77-03275 2C

CIRCULAR CENTER-FEED SEDIMENTATION TANKS

Experiments on Wastewater Sedimentation,
W77-03574 5D

SUBJECT INDEX

COLD REGIONS

CIRCULATION

- Current Measurements in the Beaufort Sea,
W77-03228 2L
- Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop),
W77-03230 6G
- Numerical Studies of Alaskan Region,
W77-03231 5B
- Salinity Induced Horizontal Estuarine Circulation,
W77-03312 2L
- Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography.
W77-03358 5B

CITIES

- Carlson V Village of Worth (Preemption of Local Regulation of Sanitary Landfill by Environmental Protection Act).
W77-03497 6E
- Water, Lighting and Sewers.
W77-03506 6E
- Eminent Domain.
W77-03517 6E
- Urban Water Use in California.
W77-03549 6B

CITY PLANNING

- Water Resources of Australia and the Pattern of Population Concentrations,
W77-03278 6D
- Urban Water Use in California.
W77-03549 6B

CLAMS

- Effects of Potassium on Adult Asiatic Clams, *Corbicula Manilensis*,
W77-03119 5C
- Effect of Temperature and Salinity on Extension of Siphons by *Mercenaria Mercenaria*,
W77-03205 5C

CLARIFICATION

- Dynamic Response of Final Settling Tanks to Transient Loading Conditions,
W77-03156 5D

CLAVATE CELLS

- Experimental Studies on the Second Intermediate Hosts of *Clonorchis Sinensis*: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of Metacercariae of *Clonorchis Sinensis* in Freshwater Fish, (In Korean),
W77-03161 5C

CLIMATIC ATLASES

- Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases,
W77-03240 5B

CLIMATIC DATA

- Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas,
W77-03239 5B

CLIMATIC EFFECTS

- The Unit Hydrograph: A Satisfactory Model of Watershed Response,
W77-03126 4D

CLIMATOLOGY

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume I - Meteorology and Hydrology of the Northern Sierra Nevada, Final Report.
W77-03213 3B
- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume II - Physical and Statistical Design, Final Report.
W77-03214 3B

CLONORCHIS-SINENSIS

- Experimental Studies on the Second Intermediate Hosts of *Clonorchis Sinensis*: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of Metacercariae of *Clonorchis Sinensis* in Freshwater Fish, (In Korean),
W77-03161 5C

CLOUD PHYSICS

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary,
W77-03212 3B
- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume I - Meteorology and Hydrology of the Northern Sierra Nevada, Final Report.
W77-03213 3B

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume II - Physical and Statistical Design, Final Report.
W77-03214 3B

- Artificial Modification of Atmospheric Processes,
W77-03303 3B

CLOUD SEEDING

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary,
W77-03212 3B

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume III - Operational Design, Final Report.
W77-03215 3B

CLUSTERING TECHNIQUES

- A Review of Clustering Techniques with Emphasis on Benthic Ecology,
W77-03372 5A

COAGULATION

- Coagulation Clarifying Effluents Contaminated with Colloid Suspensions-By Electrophoresis After Mixing in Insoluble Metallic Particles.
W77-03408 5D

COAL MINES

- Plan of Study of the Hydrology of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming.
W77-03338 4B

- Commonwealth V. Barnes and Tucker Company (Public Nuisance of Acid Mine Drainage).
W77-03519 6E

COASTAL ENGINEERING

- Quadratic Finite Elements in Shallow Water Problems,
W77-03083 8B

COASTAL PLAINS

- Multiple Use in the Southern Coastal Plains in the United States,
W77-03173 4C

- The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain,
W77-03246 2L

- Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens,
W77-03590 6G

COASTAL PROCESSES

- Yukon Delta Coastal Processes Study,
W77-03255 2L

COASTAL STRUCTURES

- Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska,
W77-03257 2L

COASTAL WATERS

- A Sweeping Sea Law in 1976.
W77-03533 6E
- Freedom of Beach,
W77-03584 6E
- A Closer Look at Some Issues for Genera-Oceans Policy, Marine Environment, and Fisheries,
W77-03585 6E

COASTAL ZONE MANAGEMENT

- 1971 Shoreline Management Act.
W77-03514 6E

- The Cost of Coastal Zoning.
W77-03535 6E

- Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens,
W77-03590 6G

- Coming Showdown: Ocean Nationalism and the Senate 200-Mile Shelf Bill,
W77-03591 6E

COASTAL ZONE MANAGEMENT ACT OF 1972 (CZMA)

- Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens,
W77-03590 6G

COASTS

- Coastal Region Residence Time Estimates from Concentration Gradients,
W77-03093 5C

- Nature and Genesis of Some Storm Washover Deposits,
W77-03293 2L

- 1971 Shoreline Management Act.
W77-03514 6E

COLD REGIONS

- A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea,
W77-03243 2L

- Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation),
W77-03244 5B

SUBJECT INDEX

COLD REGIONS

Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska, W77-03245 2L

The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain, W77-03246 2L

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L

COLIFORMS

Cyanophage Analysis as a Biological Pollution Indicator-Bacterial and Viral, W77-03460 5A

Secondary Treatment Information; Biochemical Oxygen Demand, Suspended Solids and pH, W77-03530 5G

Variations of Coliform Bacteria and Other Pollution Indices in Surface Waters, W77-03539 5B

COLIPHAGE

The Limitation of the Ratio of Fecal Coliforms to Total Coliphage as a Water Pollution Index, W77-03472 5A

COLORADO

Hydrologic Studies by the U.S. Geological Survey in Oil-Shale Areas of Colorado, Utah, and Wyoming, 1976, W77-03340 4B

Denver's Headworks Reflects Complexity of System, W77-03412 5D

Colorado Water Quality Control Act, W77-03490 6E

Individual Sewage Disposal System Act, W77-03491 6E

Floating Timber on Streams, W77-03492 6E

Specific Grants of Power (Condemnation and Rights-of-Way), W77-03493 6E

Cache La Poudre Water Users Association V Glacier View Meadows (Appropriation of Water in Plan of Augmentation), W77-03520 6E

Limnological Characteristics of Strip Mine Ponds in Northwestern Colorado, U.S.A., W77-03538 5C

COLORADO RIVER

State and County Area Tabulations for the Colorado River Basin, W77-03110 7C

COLORADO RIVER BASIN

State and County Area Tabulations for the Colorado River Basin, W77-03110 7C

COLUMBIA RIVER

Pollution of Interstate Waters of the Lower Columbia River Bonneville Dam to Cathlamet, Washington, W77-03385 5B

COLVILLE RIVER DELTA (ALASKA)

Breakup Flooding and Nutrient Source of Colville River Delta During 1973, W77-03388 5B

COMBUSTION

Combined Process of Pyrolysis and Combustion for Sludge Disposal, W77-03415 5D

COMMERCIAL FISHING

Northwest Mariculture Laws, W77-03598 6E

COMMERCIAL SHELLFISH

The Effect of Detergents on Larval Development of a Crab, W77-03189 5C

Effect of Temperature and Salinity on Extension of Siphons by Mercenaria Mercenaria, W77-03205 5C

COMPETING USES

Water Rights, W77-03599 6E

COMPREHENSIVE PLANNING

The Objectives, Part I of the State Water Plan, (Idaho Water Resources Board), W77-03544 6B

Water for Nevada. Water Planning Report, W77-03545 6B

Iowa's Water Resources Program Progress and Needs, W77-03547 6B

The State of Utah Water - 1975, W77-03559 6B

Hurdles in the Path of Coastal Plan Implementation, W77-03582 6B

COMPUTER MODELS

Calibration of a Thermal Enrichment Model for Shallow, Barricaded Estuaries, W77-03171 5B

Salinity Induced Horizontal Estuarine Circulation, W77-03312 2L

Supplement to Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow, W77-03329 2F

Automation: A Short History, But a Long Future, W77-03469 5D

Use of Hybrid Computer Model in Resource Planning, W77-03523 6A

COMPUTER PROGRAMS

A Computer Program for Estimating Costs of Owning and Operating an Irrigation Well Under Conditions of Declining Water Levels, W77-03211 6C

Computer Programs for Sediment Transport, Documentation and Listing, W77-03298 2J

CONCENTRATION GRADIENTS

Coastal Region Residence Time Estimates from Concentration Gradients, W77-03093 5C

CONCRETE MOISTURE

An Evaluation of Selected Instruments used to Measure the Moisture Content of Hardened Concrete, W77-03295 8F

CONCRETES

An Evaluation of Selected Instruments used to Measure the Moisture Content of Hardened Concrete, W77-03295 8F

CONDEMNATION

Eminent Domain, W77-03517 6E

CONFERENCES

An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report, W77-03157 6B

1973 Western State Conference on Water Information Dissemination, W77-03166 10C

Report on Tenth Annual Water Resources Research Conference, Sponsored by Office of Water Research and Technology, April 9-10, 1975, W77-03206 9D

CONGRESSIONAL HEARINGS

The Muddy Road to Clean Water, W77-03587 5G

CONJUNCTIVE USE

A Computer Program for Estimating Costs of Owning and Operating an Irrigation Well Under Conditions of Declining Water Levels, W77-03211 6C

Meeting Water Demands in Sacramento County, W77-03553 6D

CONSTRUCTION EQUIPMENT

Mechanical Mole Burrows Sewer Tunnel, W77-03397 8C

Innovations in Sewer Design and Construction, W77-03399 8G

CONSUMPTIVE USE

Cache La Poudre Water Users Association V Glacier View Meadows (Appropriation of Water in Plan of Augmentation), W77-03520 6E

Talley V Carley (Priorities to Water in 1961 Amendment to 82 Oklahoma Statutes Annotated Section 1-A), W77-03521 6E

CONTINENTAL SHELF

Current Structure and Mixing in the Shelf/Slope Water Front South of New England, W77-03087 2L

Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States, W77-03332 2L

A Sweeping Sea Law in 1976, W77-03533 6E

SUBJECT INDEX

DAMS

A Closer Look at Some Issues for General Oceans Policy, Marine Environment, and Fisheries, W77-03585 6E

Coming Showdown: Ocean Nationalism and the Senate 200-Mile Shelf Bill, W77-03591 6E

CONTOOCCOOK RIVER (NH)

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire, W77-03177 4A

CONTOURS

Clippinger V Birge (Riparian Rights in an Artificial Lake), W77-03512 6E

CONTROL STRUCTURES

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts, W77-03178 4A

Flood Plain Information: Scioto and Olentangy Rivers, Ohio, Columbus Area, Summary Report, W77-03183 4A

CONVEYANCE STRUCTURES

Irrigation Districts Powers and Purposes, W77-03515 6E

COOLING WATER

Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin, W77-03077 5C

Keep Cool with Sewage Effluent - A Two-Way Saving of Water, W77-03578 3E

COPEPODS

Seasonal Interactions Among Estuarine Primary Producers and Herbivores, W77-03387 2L

COPPER

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo gairdneri*, W77-03184 5C

Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*), W77-03203 5C

Microbial Release of Soluble Trace Metals from Oil Impacted Sediments, W77-03225 5C

COPPER ORE PROCESSING

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides, W77-03132 5D

CORE STORAGE

A Three-Dimensional Finite Element Ground Water Model, W77-03109 2F

CORN (FIELD)

Effect of Drought Stress Frequencies at Different Growth Stages on Corn Yield, W77-03143 3F

Determining the Most Profitable Nitrogen Fertilization for Corn Production, W77-03172 3F

Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matric Potential and Microclimate, W77-03394 3F

Soil Potassium Relationships as Indicated by Solution Equilibria and Plant Uptake, W77-03395 2G

CORRELATION ANALYSIS

Correlation Analysis of Hydrometeorological Data, W77-03086 2A

CORROSION

Effect of Zinc-Coated Culverts on Vertebrate and Invertebrate Fauna in Selected Maine Streams, W77-03170 5C

COST ANALYSIS

Innovations in Sewer Design and Construction, W77-03399 8G

Keep Cool with Sewage Effluent - A Two-Way Saving of Water, W77-03578 3E

An Economic Evaluation of Deep Tank Aeration for Wastewater Treatment, W77-03580 5D

COSTS

Sludge - Where Will We Put It, W77-03424 5E

COTTON

Soil Moisture Distribution Under Wide-Bed, Narrow-Row, and Conventional-Row Cotton, W77-03137 3F

CRABS

The Effect of Detergents on Larval Development of a Crab, W77-03189 5C

CRITICAL WATER PROBLEMS (WESTERN US)

An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report, W77-03157 6B

CROP PRODUCTION

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower, W77-03135 3F

Determining the Most Profitable Nitrogen Fertilization for Corn Production, W77-03172 3F

CROP RESPONSE

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower, W77-03135 3F

Effect of Water Stress on the Phasic Development of Annual Medicago Species, W77-03136 2I

Effect of Drought Stress Frequencies at Different Growth Stages on Corn Yield, W77-03143 3F

Effects of Soil-Moisture Regimes on the Growth of Barley, W77-03216 3F

Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matric Potential and Microclimate, W77-03394 3F

CROPLAND

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

CROSS-SECTIONS

The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England, W77-03314 4C

CRUDE OIL SPILL

The Effect of Oil Pollution in Bantry Bay, W77-03194 5C

CRUDE OILS

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

*CRUSTACEANS

The Effect of Detergents on Larval Development of a Crab, W77-03189 5C

CULVERTS

Effect of Zinc-Coated Culverts on Vertebrate and Invertebrate Fauna in Selected Maine Streams, W77-03170 5C

CURRENTS (WATER)

Current Structure and Mixing in the Shelf/Slope Water Front South of New England, W77-03087 2L

Effects of a Breakwater on Nearshore Currents Due to Breaking Waves, W77-03297 8B

CURVES

Flow and Bed Topography in Curved Open Channels, W77-03084 8B

DAM CONSTRUCTION

Earth and Rock-Fill Dams: Basis of Their Design and Construction, Second Edition, W77-03102 8D

DAM DESIGN

Earth and Rock-Fill Dams: Basis of Their Design and Construction, Second Edition, W77-03102 8D

DAMAGE TO LICHENS

The Effect of Oil Pollution in Bantry Bay, W77-03194 5C

DAMAGES

State Dept of Pollution Control V International Paper Co. (Determination of Fish Value That were Killed by Pollutants), W77-03498 6E

DAMS

Earth and Rock-Fill Dams: Basis of Their Design and Construction, Second Edition, W77-03102 8D

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio, W77-03174 4A

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire, W77-03177 4A

SUBJECT INDEX

DAMS

Those Nasty Phosphatic Clay Ponds,
W77-03596 5G

DAPHNIA

Response of Daphnia Population Size and Age
Structure to Predation,
W77-03390 2H

DATA BUOYS

Dynamics of Near-Shore Ice (Data Buoys),
W77-03269 2C

DATA COLLECTIONS

State and County Area Tabulations for the
Colorado River Basin,
W77-03110 7C

Retransmission of Hydrometric Data in
Canada,
W77-03111 7B

A Historical Summary of Earthquake Epicen-
ters in and Near Alaska,
W77-03265 7C

Beaufort Sea, Chukchi Sea, Bering Strait
Historical Baseline Ice Study,
W77-03275 2C

DATA STORAGE AND RETRIEVAL

1973 Western State Conference on Water Infor-
mation Dissemination,
W77-03166 10C

DATA TRANSMISSION

Retransmission of Hydrometric Data in
Canada,
W77-03111 7B

DDE

Effects of Chronic DDT/DDE Exposure on
Anesthetic Induction and Recovery Times in
Rainbow Trout (Salmo Gairdneri),
W77-03204 5C

DDT

Effects of Chronic DDT/DDE Exposure on
Anesthetic Induction and Recovery Times in
Rainbow Trout (Salmo Gairdneri),
W77-03204 5C

DECISION MAKING

Local Water Systems are Frequently
Neglected,
W77-03121 6B

The Legal Framework for Public Participation
in Canadian Water Management,
W77-03543 6E

The State of Utah Water - 1975,
W77-03559 6B

DELAWARE

Hydraulic Characteristics of the Piney Point
Aquifer and Overlying Confining Bed Near
Dover, Delaware,
W77-03331 2F

Delaware 1975 State Water Quality Inventory,
W77-03378 5G

Glassman V. Weldin Farms, Inc. (No Right in
Upper Land Owner to Artificially Increase the
Natural Drainage of Surface Water to Increase
Flooding on Land of Lower Property).
W77-03518 6E

DELTAS

Yukon Delta Coastal Processes Study,
W77-03255 2L

Plan for Improvement of the Delta Levees.
W77-03550 4A

DENITRIFICATION

Dorr-Oliver to Market Ecolotrol Waste Water
Treatment Process.
W77-03417 5D

DENSITY

Salinity Induced Horizontal Estuarine Circula-
tion,
W77-03312 2L

DENSITY CURRENTS

Two Dimensional Bottom Withdrawal from a
Density-Stratified Reservoir,
W77-03129 4A

A Perturbation Approach to Two-Dimensional
Bottom Withdrawal from a Density-Stratified
Reservoir,
W77-03151 4A

DENVER (COLO)

Denver's Headworks Reflects Complexity of
System,
W77-03412 5D

DEPOSITION

A Study of Beaufort Sea Coastal Erosion -
Northern Alaska,
W77-03266 2L

DESALINATION PROCESSES

One Pass Seawater Desalting RO Pilot Plant
Evaluation,
W77-03076 3A

Studies on a Mechanism for Salt Rejection in
Reverse Osmosis Membranes as a Guide to Im-
proved Materials for Desalination of Sea
Water.
W77-03290 3A

DESERT PLANTS

A Comparison of Seasonal Primary Production
of Mojave Desert Shrubs During Wet and Dry
Years,
W77-03138 2I

Comparative Photosynthetic Production of
Mojave Desert Shrubs,
W77-03141 2D

DESIGN

Earth and Rock-Fill Dams: Basis of Their
Design and Construction, Second Edition,
W77-03102 8D

Application of a Model for Layout and Design
of Sewer Systems,
W77-03133 5B

Automation: A Short History, But a Long Fu-
ture,
W77-03469 5D

DESIGN CRITERIA

Cavitation From Surface Irregularities in High
Velocity,
W77-03082 8B

Weather Modification Design Study for
Streamflow Augmentation in the Northern Si-
erra Nevada, Volume III - Operational Design,
W77-03215 3B

System for Dewatering Dilute Slurries,
W77-03352 5D

Ship-to-Shore Sewage Hose Handling Tests,
W77-03364 5D

Advanced Trickling Filter for Wastewater
Treatment,
W77-03365 5D

Sewerage Treatment Apparatus,
W77-03406 5D

Biological Purification of Sewage Water-In a
Multi-Stage Treatment Tank With Rotating
Contactor Surfaces Partly Immersed in the
Liquid.
W77-03407 5D

Coagulation Clarifying Effluents Contaminated
with Colloid Suspensions-By Electrophoresis
After Mixing in Insoluble Metallic Particles.
W77-03408 5D

Biological Converter for Faecal Matter in
Water - Using Rotary Tubes With Fibrous
Filling Supporting the Bacterial Culture.
W77-03409 5D

Sludge Dewatering Pilot Plant Design, Part I,
W77-03416 5D

DESTRATIFICATION

Physiochemical and Biological Conditions in
Two Oklahoma Reservoirs Undergoing Arti-
ficial Destratification,
W77-03208 2H

Allatoona Lake, Destratification Equipment
Test Report.
W77-03306 5G

DETERGENT

Influence of Illumination on Phytotoxicity of
Crude Oil,
W77-03193 5C

DETERGENTS

The Effect of Oil Pollution in Bantry Bay,
W77-03194 5C

DEWATERING

Characterization and Dewaterability of Water
Treatment Plant Residues,
W77-03130 5D

A Butane Freezing Process for Dewatering
Sludge,
W77-03153 5D

System for Dewatering Dilute Slurries,
W77-03352 5D

Centrifuge for Dewatering Sewage Sludge.
W77-03410 5D

Minimizing the Waste Discharges from Water
Treatment Plants,
W77-03455 5D

DIFFUSION

Preparation of Hydrodynamical-Numerical and
3-Parameter Small-Mesh Atmospheric Models
for Coastal Waters in the Gulf of Alaska,
W77-03235 5B

DIGESTION

Effect of Copper on Some Aspects of the
Bioenergetics of Rainbow Trout (Salmo gaird-
neri),
W77-03203 5C

An Operator's Approach to Aerobic Digester
Supernatant Disposal Problems,
W77-03449 5D

Supernatant Decanting of Aerobically Digested
Waste Activated Sludge,
W77-03450 5D

DISINFECTION

Chlorine Disinfection of Treated Wastewater in
a Baffled Contact Chamber at Less Than 1 C,
W77-03363 5D

SUBJECT INDEX

EDDY ENERGY

- Ultraviolet Disinfection: An Alternative to Chlorination, W77-03445 5D
- DISSOLVED MANGANESE**
A Model for the Control of Dissolved Manganese in the Interstitial Waters of Chesapeake Bay, W77-03556 5B
- DISSOLVED OXYGEN**
Evaluation of Lake Milner Water Quality Model, W77-03373 5B
Methods of Dissolved Oxygen Budget Analysis for Assessing Effects of Dredged Material Disposal on Biological Community Metabolism, W77-03393 5C
Oxygen and Air Activated Sludge: Another View, W77-03444 5D
Effect of Variable Loading on Oxygen Uptake, W77-03473 5D
Effect of High Dissolved Oxygen Concentration in Activated Sludge Systems, W77-03571 5D
- DISTRIBUTION**
Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin, W77-03077 5C
Distribution and Feeding of Pumpkinseed (*Lepomis gibbosus*) and Black Crappie (*Pomoxis nigromaculatus*) in a power plant cooling lake, W77-03078 5C
Environmental Status of the Lake Michigan Region. Vol. 17. Inland Fishes of the Lake Michigan Drainage Basin, W77-03566 6G
- DISTRIBUTION PATTERNS**
Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea, W77-03226 5B
Water Resources of Australia and the Pattern of Population Concentrations, W77-03278 6D
- DISTROPHY**
Water Quality, Plankton and Eutrophication of Bergsvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian), W77-03595 5C
- DITCHES**
Ditch Companies, W77-03501 6E
- DIVERSION**
Head Gates; Powers of State Engineer, W77-03507 6E
Cache La Poudre Water Users Association V Glacier View Meadows (Appropriation of Water in Plan of Augmentation), W77-03520 6E
- DOCUMENTATION**
1973 Western State Conference on Water Information Dissemination, W77-03166 10C
- DOMESTIC WASTES**
A Study of Mixing Characteristics of Sewage Stabilization Ponds with Radioactive Tracers, W77-03461 5D
- DORMANCY**
Seasonal Demarcation in Pennsylvania for Hydrological Use, W77-03127 2B
- DORMANT SEASON**
Seasonal Demarcation in Pennsylvania for Hydrological Use, W77-03127 2B
- DRAINAGE AREA**
State and County Area Tabulations for the Colorado River Basin, W77-03110 7C
- DRAINAGE DITCHES**
Practical Alternatives to 2,4,5-T for Chemical Control of Brush Along Drainage Ditches and General Watershed Use, W77-03168 5G
- DREDGING**
Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota, W77-03094 5C
Silt Removal from a Lake Bottom, W77-03392 5C
- DRIFTING (AQUATIC)**
Seasonal Variation of Residual Drift in Long Island Sound, W77-03322 2L
- DRILLING**
Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L
- DRILLING SAMPLES**
Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B
- DROUGHT RESISTANCE**
Changes in the Transpiration Rate and Leaf Water Content in Several Varieties of *Cryptomeria Japonica* Subjected to Water Stress, (In Japanese), W77-03155 2D
- DROUGHT TOLERANCE**
Changes in the Transpiration Rate and Leaf Water Content in Several Varieties of *Cryptomeria Japonica* Subjected to Water Stress, (In Japanese), W77-03155 2D
- DROUGHTS**
Wet and Dry Periods of Annual Flow Series, W77-03319 2E
- DRYING**
Sludge Drying Beds are Practical: Part 2, W77-03572 5D
- DRYING BEDS**
Sludge Drying Beds are Practical: Part 2, W77-03572 5D
- DUCTILE IRON PIPE**
Ductile Iron Pipe Solves a Tough Sewer Problem at Jimerson Creek, W77-03398 8G
- DUWAMISH BASIN (WASH)**
A Study of the Suspended Particulate Problem in the Duwamish Basin, W77-03291 5A
- EARTH DAMS**
Earth and Rock-Fill Dams: Basis of Their Design and Construction, Second Edition, W77-03102 8D
Piping in Earth Dams Constructed of Dispersive Clay: Literature Review and Design of Laboratory Tests, W77-03112 8D
- EARTHQUAKES**
A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L
Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L
Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L
A Historical Summary of Earthquake Epicenters in and Near Alaska, W77-03265 7C
- ECOLOGY**
Ecology of Aquatic Saprophytic Phycomycetes. II, (In Russian), W77-03201 5C
- ECONOMIC FEASIBILITY**
An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D
- ECONOMIC JUSTIFICATION**
Investigation of the Physical Feasibility of Mobile Fish Processing Plants, W77-03558 6B
- ECONOMIC ZONES**
Coming Showdown: Ocean Nationalism and the Senate 200-Mile Shelf Bill, W77-03591 6E
- ECONOMICS**
Residual Waste Management Research and Planning Projects, September 1975, W77-03355 5B
- ECOSYSTEMS**
The Effects of Sewage Effluent on Wetland Ecosystems, W77-03354 5C
Investigations on the Role of Dissolved Organic Matter in Determining Ecosystem Structure and Function: The Plankton and Photoheterotrophy, W77-03389 5C
- EDDIES**
Eddy Kinetic Energy in the Deep Western North Atlantic, W77-03088 2L
- EDDY ENERGY**
Eddy Kinetic Energy in the Deep Western North Atlantic, W77-03088 2L

SUBJECT INDEX

EELGRASS

EELGRASS

Feasibility of Transplantation, Revegetation, and Restoration of Eelgrass in San Diego Bay, California, W77-03546 5G

EFFECTIVE POROSITY

Measurement of Nonexchanging Pores During Miscible Displacement in Soils, W77-03320 2G

EFFICIENCIES

Oxygen Transfer in a 23-Meter Bubble Column, W77-03579 5D

EFFLUENTS

Suitability of Lagoon Effluents for Irrigation in South Dakota, W77-03152 5D

Proposed Toxic Pollutant Effluent Standards, W77-03529 5G

Implementing the National Water Pollution Control Permit Program: Progress and Problems, W77-03588 5G

ELECTRIC POWER

Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I, W77-03288 6E

ELECTRIC POWER PRODUCTION

Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I, W77-03288 6E

ELECTROLYSIS

The Electrolytic Respirometer - I. Factors Affecting Oxygen Uptake Measurements, W77-03457 5A

ELECTROPHORESIS

Coagulation Clarifying Effluents Contaminated with Colloid Suspensions-By Electrophoresis After Mixing in Insoluble Metallic Particles, W77-03408 5D

EMBANKMENTS

Undrained Behavior of Embankments on New Liskeard Varved Clay, W77-03108 8D

EMINENT DOMAIN

Specific Grants of Power (Condemnation and Rights-of-Way), W77-03493 6E

Control of Water and Eminent Domain, W77-03503 6E

General Basis of Water Rights in Utah, W77-03504 6E

Flood Control Projects and Drought Emergencies, W77-03505 6E

Eminent Domain, W77-03517 6E

ENDOTOXINS

Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water, W77-03474 5A

ENERGY

Eddy Kinetic Energy in the Deep Western North Atlantic, W77-03088 2L

Large Factory-Built Pump Station Begins Operation, W77-03438 8C

ENERGY EQUATION

Minimizing the Waste Discharges from Water Treatment Plants, W77-03455 5D

ENGINEERING STRUCTURES

Waterway Districts, W77-03516 6E

ENGLAND

The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England, W77-03314 4C

ENTERIC VIRUSES

Field Monitoring Techniques and Data Analysis, W77-03150 5A

ENTROPHICATION

Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French), W77-03144 5C

ENVIRONMENTAL EFFECTS

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea, W77-03217 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska, W77-03218 5C

Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf, W77-03224 5B

Microbial Release of Soluble Trace Metals from Oil Impacted Sediments, W77-03225 5C

Current Measurements in the Beaufort Sea, W77-03228 2L

Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas, W77-03229 5C

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B

STD Mappings of the Beaufort Sea Shelf, W77-03233 2L

Outer Continental Shelf Energy Program, W77-03234 5B

Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska, W77-03235 5B

Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program, W77-03237 5A

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas, W77-03239 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases, W77-03240 5B

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

Near-Shore Atmospheric Modification, W77-03242 5B

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B

Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska, W77-03245 2L

The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain, W77-03246 2L

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf, W77-03248 2L

Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L

Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L

Distribution and Character of Icings in Northeastern Alaska, W77-03252 2C

A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs, W77-03253 5B

Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska, W77-03259 2L

Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

SUBJECT INDEX

EXPANSIVE SOILS

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

Beaufort Seacoast Permafrost Studies, W77-03262 2C

Benthos-Sedimentary Substrate Interactions, W77-03263 5C

Faulting and Instability of Shelf Sediments - Western Gulf of Alaska, W77-03264 2L

A Historical Summary of Earthquake Epicenters in and Near Alaska, W77-03265 7C

A Study of Beaufort Sea Coastal Erosion - Northern Alaska, W77-03266 2L

The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C

Dynamics of Near-Shore Ice, W77-03268 2C

Study of Climatic Effects on Fast Ice Extent and its Seasonal Decay Along the Beaufort Sea Coast, W77-03270 2C

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L

Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03272 2C

Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03273 2C

Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures, W77-03274 2C

Hydrology and Environmental Aspects of Erie Canal (1817-99), W77-03334 8B

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D

A Sweeping Sea Law in 1976, W77-03533 6E

Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens, W77-03590 6G

ENVIRONMENTAL GEOLOGY

The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain, W77-03246 2L

ENVIRONMENTAL SANITATION

Carlson V Village of Worth (Preemption of Local Regulation of Sanitary Landfill by Environmental Protection Act), W77-03497 6E

Marine Sanitation Device Standard, W77-03531 5G

EQUATIONS

Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A

A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03151 4A

EQUIPMENT

Sewerage Treatment Apparatus, W77-03406 5D

Biological Purification of Sewage Water-In a Multi-Stage Treatment Tank With Rotating Contactor Surfaces Partly Immersed in the Liquid, W77-03407 5D

Fluidized Waste Incinerator and Method, W77-03489 5D

ERIE CANAL

Hydrology and Environmental Aspects of Erie Canal (1817-99), W77-03334 8B

EROSION

The Illinois Coastal Zone Management Program: First Year Work Product. Volume II. Coastal Geological Studies, W77-03103 2H

Environmental Impact of Land Use on Water Quality, Progress Report, W77-03106 5G

A Study of Beaufort Sea Coastal Erosion - Northern Alaska, W77-03266 2L

EROSION CONTROL

Afforestation in Low Rainfall Areas, W77-03139 4D

ESTIMATING COSTS

A Computer Program for Estimating Costs of Owning and Operating an Irrigation Well Under Conditions of Declining Water Levels, W77-03211 6C

ESTUARIES

Quadratic Finite Elements in Shallow Water Problems, W77-03083 8B

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary, W77-03091 2L

Calibration of a Thermal Enrichment Model for Shallow, Barricaded Estuaries, W77-03171 5B

Flow Dynamics of the Neuse River Estuary, W77-03300 2L

Salinity Induced Horizontal Estuarine Circulation, W77-03312 2L

Seasonal Variation of Residual Drift in Long Island Sound, W77-03322 2L

Sediment Mass Balance of a Large Estuary, Long Island Sound, W77-03323 2L

Seasonal Interactions Among Estuarine Primary Producers and Herbivores, W77-03387 2L

ESTUARINE CIRCULATION

Salinity Induced Horizontal Estuarine Circulation, W77-03312 2L

ETHANOLAMINE

Experimental Substantiation of the Maximal Permissible Concentrations of Triethanolamine, Ammonium and Calcium Salts of Alkylbenzosulfates in Water Bodies, (In Russian), W77-03586 5B

EUTROPHICATION

Surf-Zone Water Quality in Liverpool Bay, W77-03092 5B

Organic Phosphorus in Lakes, W77-03210 5C

The Primary Production of the Periphyton Association Oedogonia-Epithemium Litorale, W77-03374 5C

Lake Phosphorus Loading Graphs: An Alternative, W77-03377 5C

Silt Removal from a Lake Bottom, W77-03392 5C

The Aerial Photo-Water Quality Link, W77-03471 5A

Eutrophication and Restoration of Lakes Receiving Nutrients from Diffuse Sources Only, W77-03536 5C

Water Quality, Plankton and Eutrophication of Bergsvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian), W77-03595 5C

EVALUATION

An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D

An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report, W77-03157 6B

Conducting Sewer System Evaluations for Small Systems, W77-03581 5D

EVAPORATION

Vegetative Water Use in California, 1974, W77-03554 3F

EVAPOTRANSPIRATION

Computation of the Potential Evapotranspiration and Their Comparison with Values of the Actual Evapotranspiration of Lysimeters, (In German), W77-03118 2D

Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D

Vegetative Water Use in California, 1974, W77-03554 3F

EXPANSIVE SOILS

On the Validity of the Theory of Flow in Saturated Swelling Materials, W77-03280 2G

Infiltration and Water Movement in an in Situ Swelling Soil During Prolonged Ponding, W77-03281 2G

SUBJECT INDEX

EXPLOSIONS

EXPLOSIONS

- Use of Intrinsically Safe Instrumentation.
W77-03462

5A

EXTENDED AERATION

- Small Village Gets Advanced Treatment.
W77-03440

5D

FACILITIES

- Specific Grants of Power (Condemnation and Rights-of-Way).
W77-03493

6E

- The California State Water Project in 1975.
W77-03551

6B

FARM WASTES

- Treatment of Livestock Wastes by a Barrired Landscape Water Renovation System,
W77-03116

5D

FARMINGTON GLADE (NM)

- Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico.
W77-03176

4A

FARMINGTON (NM)

- Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico.
W77-03176

4A

FARMS

- The Impact of Intensive Application of Pesticides and Fertilizers on Underground Water Recharge Areas which May Contribute to Drinking Water Problems,
W77-03567

5B

FAST ICE

- Study of Climatic Effects on Fast Ice Extent and its Seasonal Decay Along the Beaufort Sea Coast,
W77-03270

2C

- Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies,
W77-03277

7B

FAULTS (GEOLOGIC)

- Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin,
W77-03256

2L

- Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska,
W77-03257

2L

FEASIBILITY

- Ammonia Removal from Wastewater by Ligand Exchange,
W77-03367

5D

FEDERAL PROJECT POLICY

- Report on Tenth Annual Water Resources Research Conference, Sponsored by Office of Water Research and Technology, April 9-10, 1975.
W77-03206

9D

- California Water Project: Law and Politics,
W77-03583

6E

FEDERAL RECLAMATION LAW

- California Water Project: Law and Politics,
W77-03583

6E

FEDERAL WATER POLLUTION CONTROL ACT

- Virginia State Program for Control of Discharge of Pollutants to Navigable Waters; Approval.
W77-03527

5G

- Organic Chemicals Manufacturing Point Source Category-Effluent Limitations and Guidelines (Amendments to Regulations-Butadiene).
W77-03528

5G

- Proposed Toxic Pollutant Effluent Standards.
W77-03529

5G

- The Muddy Road to Clean Water,
W77-03587

5G

FEEDING RATES

- Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*),
W77-03203

5C

FERMENTATION

- Fermentation of Waste Materials to Produce Industrial Intermediates,
W77-03563

5D

FERTILIZATION

- Determining the Most Profitable Nitrogen Fertilization for Corn Production,
W77-03172

3F

FERTILIZERS

- The Impact of Intensive Application of Pesticides and Fertilizers on Underground Water Recharge Areas which May Contribute to Drinking Water Problems,
W77-03567

5B

FIELD GEOMETRY EFFECTS

- Evapotranspiration Reduction by Field Geometry Effects,
W77-03169

2D

FILTERS

- The Rotating Biological Filter,
W77-03282

5D

- High Gradient Magnetic Filtration,
W77-03418

5D

- Laboratory Studies on the Effects of Temperature on Accumulation of Solids in Biological Filters,
W77-03464

5D

FILTRATION

- High Gradient Magnetic Filtration,
W77-03418

5D

- 'Give Floitation a Try' was Challenged.
W77-03439

5F

- Small Village Gets Advanced Treatment.
W77-03440

5D

FINAL SETTLING TANKS

- Dynamic Response of Final Settling Tanks to Transient Loading Conditions,
W77-03156

5D

FINITE ELEMENT ANALYSIS

- A Three-Dimensional Finite Element Ground Water Model,
W77-03109

2F

- Supplement to Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow,
W77-03329

2F

FISH

- Experimental Studies on the Second Intermediate Hosts of *Clonorchis Sinensis*: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of *Metacercariae* of *Clonorchis Sinensis* in Freshwater Fish, (In Korean),
W77-03161

5C

- Environmental Inventory and Assessment of Navigation Pools 24, 25, and 26, Upper Mississippi and Lower Illinois Rivers; An Electrofishing Survey of the Illinois River,
W77-03302

8I

- Poisoning of, and Obstruction to, Fish.
W77-03500

6E

FISH BEHAVIOR

- Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*,
W77-03184

5C

FISH DISEASES

- Experimental Studies on the Second Intermediate Hosts of *Clonorchis Sinensis*: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of *Metacercariae* of *Clonorchis Sinensis* in Freshwater Fish, (In Korean),
W77-03161

5C

- Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea,
W77-03226

5B

FISH FARMING

- Northwest Mariculture Laws,
W77-03598

6E

FISH MIGRATION

- Reproduction by Adfluvial Salmonids in Spaw Creek, Cache County, Utah,
W77-03160

2I

FISH PARASITES

- Experimental Studies on the Second Intermediate Hosts of *Clonorchis Sinensis*: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of *Metacercariae* of *Clonorchis Sinensis* in Freshwater Fish, (In Korean),
W77-03161

5C

FISH PHYSIOLOGY

- Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*,
W77-03184

5C

FISH POPULATIONS

- Environmental Inventory and Assessment of Navigation Pools 24, 25, and 26, Upper Mississippi and Lower Illinois Rivers; An Electrofishing Survey of the Illinois River,
W77-03302

8I

FISH REPRODUCTION

- Reproduction by Adfluvial Salmonids in Spaw Creek, Cache County, Utah,
W77-03160

2I

FISHERIES

- Limnological Characteristics of Strip Mine Ponds in Northwestern Colorado, U.S.A.,
W77-03538

5C

FISHES

- Environmental Status of the Lake Michigan Region. Vol. 17. Inland Fishes of the Lake Michigan Drainage Basin,
W77-03566

6G

FISHING

- Pollution of Interstate Waters of the Lower Columbia River Bonneville Dam to Cathlamet, Washington.
W77-03385

5B

SUBJECT INDEX

FLOOD RECURRENCE INTERVAL

A Sweeping Sea Law in 1976.
W77-03533

6E

FISHKILL

State Dept of Pollution Control V International Paper Co. (Determination of Fish Value That were Killed by Pollutants).
W77-03498

6E

FLASH FLOODS

Guidelines for Flash Flood and Small Tributary Flood Prediction,
W77-03114

4A

FLOOD CHANNELS

Flood Control Projects and Drought Emergencies.
W77-03505

6E

FLOOD CHARACTERISTICS

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire.
W77-03177

4A

FLOOD CONTROL

Flood Control Projects and Drought Emergencies.
W77-03505

6E

Flood Disaster Protection Act of 1973,
W77-03522

6F

Plan for Improvement of the Delta Levees.
W77-03550

4A

Corps' New Look in Flood Control: No Dams, Levees,
W77-03593

4A

FLOOD DAMAGE

Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois,
W77-03175

4A

Flood Disaster Protection Act of 1973,
W77-03522

6F

FLOOD DATA

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio.
W77-03174

4A

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire.
W77-03177

4A

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana.
W77-03182

4A

FLOOD EVENTS

The Unit Hydrograph: A Satisfactory Model of Watershed Response,
W77-03126

4D

FLOOD FLOW

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York,
W77-03337

4A

FLOOD FORECASTING

Retransmission of Hydrometric Data in Canada,
W77-03111

7B

Guidelines for Flash Flood and Small Tributary Flood Prediction,
W77-03114

4A

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana.
W77-03182

4A

Depth and Frequency of Floods in Illinois,
W77-03346

2E

FLOOD FREQUENCY

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York,
W77-03337

4A

Depth and Frequency of Floods in Illinois,
W77-03346

2E

FLOOD PLAIN INSURANCE

Flood Disaster Protection Act of 1973,
W77-03522

6F

FLOOD PLAIN ZONING

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana.
W77-03182

4A

FLOOD PLAINS

Hydrogeology of the Missouri River Flood Plain near Glasgow, Missouri,
W77-03164

2F

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio.
W77-03174

4A

Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois,
W77-03175

4A

Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico.
W77-03176

4A

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire.
W77-03177

4A

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts.
W77-03178

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska: Volume I, Summary Report; Salt Creek, Haines Branch and Beal Slough, Salt Creek Basin.
W77-03179

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume II, Summary Report, Antelope Creek, Dead Mans Run, and Middle Creek, Salt Creek Basin.
W77-03180

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin.
W77-03181

4A

Flood Plain Information: Scioto and Olentangy Rivers, Ohio, Columbus Area, Summary Report.
W77-03183

4A

National Program for Managing Flood Losses: Guidelines for Preparation, Transmittal, and Distribution of Flood-Prone Area Maps and Pamphlets,
W77-03341

7C

FLOOD PROFILES

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio.
W77-03174

4A

Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois,
W77-03175

4A

Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico.
W77-03176

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska: Volume I, Summary Report; Salt Creek, Haines Branch and Beal Slough, Salt Creek Basin.
W77-03179

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume II, Summary Report, Antelope Creek, Dead Mans Run, and Middle Creek, Salt Creek Basin.
W77-03180

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin.
W77-03181

4A

FLOOD-PRONE AREA MAPS

National Program for Managing Flood Losses: Guidelines for Preparation, Transmittal, and Distribution of Flood-Prone Area Maps and Pamphlets,
W77-03341

7C

FLOOD PROTECTION

Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois,
W77-03175

4A

Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico.
W77-03176

4A

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire.
W77-03177

4A

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts.
W77-03178

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume II, Summary Report, Antelope Creek, Dead Mans Run, and Middle Creek, Salt Creek Basin.
W77-03180

4A

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana.
W77-03182

4A

Flood Disaster Protection Act of 1973,
W77-03522

6F

FLOOD RECURRENCE INTERVAL

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York,
W77-03337

4A

Depth and Frequency of Floods in Illinois,
W77-03346

2E

SUBJECT INDEX

FLOOD STAGES

FLOOD STAGES

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire.
W77-03177 4A

FLOODING

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana.
W77-03182 4A

FLOODPROOFING

Corps' New Look in Flood Control: No Dams, Levees,
W77-03593 4A

FLOODS

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio.
W77-03174 4A

Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois,
W77-03175 4A

Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico.
W77-03176 4A

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire.
W77-03177 4A

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts.
W77-03178 4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska: Volume I, Summary Report; Salt Creek, Haines Branch and Beal Slough, Salt Creek Basin.
W77-03179 4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume II, Summary Report, Antelope Creek, Dead Mans Run, and Middle Creek, Salt Creek Basin.
W77-03180 4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin.
W77-03181 4A

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana.
W77-03182 4A

Flood Plain Information: Scioto and Olentangy Rivers, Ohio, Columbus Area, Summary Report.
W77-03183 4A

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida,
W77-03304 2L

Wet and Dry Periods of Annual Flow Series,
W77-03319 2E

Glassman V. Weldin Farms, Inc. (No Right in Upper Land Owner to Artificially Increase the Natural Drainage of Surface Water to Increase Flooding on Land of Lower Property).
W77-03518 6E

FLORA VISTA ARROYO (NM)

Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico.
W77-03176 4A

FLORIDA

Calibration of a Thermal Enrichment Model for Shallow, Barricaded Estuaries,
W77-03171 5B

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida,
W77-03304 2L

High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida,
W77-03344 7B

State Dept of Pollution Control V International Paper Co. (Determination of Fish Value That were Killed by Pollutants).
W77-03498 6E

Water Management and Regulation of Water Use,
W77-03525 6B

Those Nasty Phosphatic Clay Ponds,
W77-03596 5G

FLOTATION

'Give Flotation a Try' was Challenged.
W77-03439 5F

Flotation for Water and Wastewater Treatment,
W77-03576 5D

FLOW AROUND OBJECTS

Hydrodynamic Forces on Multiple Circular Cylinders,
W77-03081 8B

FLOW CHARACTERISTICS

A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs,
W77-03253 5B

FLOW CONTROL

Flow Equalization by Use of Aeration Tank Volume,
W77-03446 5D

Flood Control Projects and Drought Emergencies.
W77-03505 6E

FLOW PATTERNS

Outer Continental Shelf Energy Program,
W77-03234 5B

FLOW RATES

Experiments on Wastewater Sedimentation,
W77-03574 5D

FLOW REGIME

Physical Oceanography of the Gulf of Alaska,
W77-03241 5B

FLOW SEPARATION

Normal-Mode Analysis of the Structure of Baseflow Recession Curves,
W77-03313 2F

FLUVIAL HYDRAULICS

Minimum Unit Stream Power and Fluvial Hydraulics,
W77-03080 8B

FOAM FRACTIONATION

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides,
W77-03132 5D

The Application of the Foam Fractionation Process to the Removal of Viruses. Part I. The Production of a Mathematical Model to Predict the Efficiency of Virus Removal,
W77-03433 5D

FOG

Electrostatic Induction Parameters to Attain Maximum Spray Charge to Clear Fog,
W77-03299 3B

FOG CLEARING

Electrostatic Induction Parameters to Attain Maximum Spray Charge to Clear Fog,
W77-03299 3B

FOOD CHAINS

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada,
W77-03199 5C

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program,
W77-03237 5A

Limnological Characteristics of Strip Mine Ponds in Northwestern Colorado, U.S.A.,
W77-03538 5C

FOOD HABITS

Seasonal Interactions Among Estuarine Primary Producers and Herbivores,
W77-03387 2L

FORCE COEFFICIENTS

Hydrodynamic Forces on Multiple Circular Cylinders,
W77-03081 8B

FORECASTING

Prediction of Water Transmission in Conditioned Soils,
W77-03451 2G

FOREST FIRES

The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota,
W77-03375 5B

FOREST MANAGEMENT

Afforestation in Low Rainfall Areas,
W77-03139 4D

Multiple Use in the Southern Coastal Plains in the United States,
W77-03173 4C

FOREST SOILS

Effect of Added Salts on Nitrogen Released and Nitrate Levels in Forest Soils of the Washington Coastal Area,
W77-03396 2G

FORESTED AREAS

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method,
W77-03147 5D

FORESTRY

Afforestation in Low Rainfall Areas,
W77-03139 4D

FORESTS

Experimental Ecology of Selected Vertebrate Species,
W77-03564 6G

SUBJECT INDEX

GROUNDWATER

FREE SURFACE FLOW

Hydrologic Engineering Methods for Water Resources Development, Volume 6, Water Surface Profiles, W77-03105 8B

FREEZING

A Butane Freezing Process for Dewatering Sludge, W77-03153 5D

FROTH FLOTATION

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides, W77-03132 5D

FURROW IRRIGATION

Soil Moisture Distribution Under Wide-Bed, Narrow-Row, and Conventional-Row Cotton, W77-03137 3F

FUTURE PLANNING (PROJECTED)

The State of Utah Water, W77-03560 6D

FWPCA AMENDMENTS OF 1972

Paint Formulating Point Source Category Effluent Guidelines and Standards, W77-03526 5G

Secondary Treatment Information; Biochemical Oxygen Demand, Suspended Solids and pH, W77-03530 5G

Marine Sanitation Device Standard, W77-03531 5G

The Hard Job of Saving Lake Erie, W77-03534 5G

The Muddy Road to Clean Water, W77-03587 5G

The Wyoming Water Quality Act and the Federal Water Pollution Control Act Amendments of 1972: A Comparison, W77-03600 5G

GALERKIN TECHNIQUE

A Three-Dimensional Finite Element Ground Water Model, W77-03109 2F

GAS RESERVES

Unions Fight a Jones Act Waiver, W77-03532 6E

GASES

Use of Intrinsically Safe Instrumentation, W77-03462 5A

GEOCHEMISTRY

Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French), W77-03144 5C

GEOLOGIC MAPPING

High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida, W77-03344 7B

GEOLOGICAL SURVEYS

The Illinois Coastal Zone Management Program: First Year Work Product. Volume II. Coastal Geological Studies, W77-03103 2H

GEOLOGY

The Illinois Coastal Zone Management Program: First Year Work Product. Volume II. Coastal Geological Studies, W77-03103 2H

GEOMORPHOLOGY

The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain, W77-03246 2L

Structure of the Glacier Charles Rabots Bre, Norway, W77-03311 2C

GEORGIA

Allatoona Lake, Destratification Equipment Test Report, W77-03306 5G

Allatoona Lake, Destratification Equipment Test, Appendix A, Operational and Water Quality Data, 1968, W77-03307 5G

Allatoona Lake, Destratification Equipment Test, Appendix B, Operational and Water Quality Data, 1969, W77-03308 5G

Allatoona Lake, Destratification Equipment Test, Appendix C, Operational and Water Quality Data, 1970, W77-03309 5G

Ground-Water Quality Data for Georgia, W77-03333 7C

GEO THERMAL STUDIES

Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California, W77-03348 7C

GEO THERMAL WELLS

Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California, W77-03348 7C

GLACIERS

Structure of the Glacier Charles Rabots Bre, Norway, W77-03311 2C

GLACIOLOGY

Structure of the Glacier Charles Rabots Bre, Norway, W77-03311 2C

GLUTAMIC ACID

Biochemical Mechanisms in the Methane Fermentation of Glutamic and Oleic Acids, W77-03441 5D

GNADENSEE

Experimental Studies on Material Transactions Between Mud and Water of the Gnadensee, W77-03370 5C

GOOSE BARNACLES

Effects of Oil on Beaches in West Cork, Ireland, W77-03192 5C

GOVERNMENTAL INTERRELATIONS

Hurdles in the Path of Coastal Plan Implementation, W77-03582 6B

The Wyoming Water Quality Act and the Federal Water Pollution Control Act Amendments of 1972: A Comparison, W77-03600 5G

GRADUALLY VARIED FLOW

Exact Solution of Gradually Varied Flow, W77-03085 8B

GRAIN SORGHUM

Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D

GRAND LAKE (OHIO)

A Preliminary Study of the Taste and Odor Problems in Grand Lake, Ohio and the Wabash Rivers, Indiana, W77-03384 5C

GRANTS

Grant Aid for Plant Operations: An Evaluation, W77-03483 5G

GRASSES

Computation of the Potential Evapotranspiration and Their Comparison with Values of the Actual Evapotranspiration of Lysimeters, (In German), W77-03118 2D

Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions, W77-03142 2D

GREAT LAKES

Coastal Region Residence Time Estimates from Concentration Gradients, W77-03093 5C

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

Great Lakes Compact Commission, W77-03513 6E

SUBJECT INDEX

GROUNDWATER

Low Flow Modeling in Small Steep Watersheds, W77-03316 4D

Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico--1975, W77-03327 7C

Maps Showing Ground-Water Conditions in the San Bernardino Valley Area Cochise County, Arizona--1975, W77-03328 7C

Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California. W77-03342 2K

Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968 - January 1975, W77-03343 5A

Groundwater Quality Adjacent to a Septic Tank System, W77-03456 5D

GROUNDWATER AVAILABILITY

The Occurrence of Groundwater in the Satpura Region of Central India, W77-03146 4B

Ground-Water Quality Data for Georgia, W77-03333 7C

GROUNDWATER BASINS

California's Groudud Water. W77-03548 4B

GROUNDWATER MINING

The Occurrence of Groundwater in the Satpura Region of Central India, W77-03146 4B

GROUNDWATER MOVEMENT

Supplement to Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow, W77-03329 2F

GROUNDWATER RECHARGE

Permeability and Ground Water Circulation in the Madison Aquifer Along the Eastern Flank of the Bighorn Mountains of Wyoming, W77-03122 2F

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

Ground Water Basin Protection Projects: Fremont Salinity Barrier. W77-03555 4B

The Impact of Intensive Application of Pesticides and Fertilizers on Underground Water Recharge Areas which May Contribute to Drinking Water Problems, W77-03567 5B

GROUNDWATER RESOURCES

Measured and Simulated Ground-Water Levels in the Franklin Area, Southeastern Virginia, W77-03326 7C

Ground-Water Levels in New Mexico, 1975, W77-03330 7C

Ground-Water Quality Data for Georgia, W77-03333 7C

Buried Aquifers in the Brooten-Belgrade and Lake Emily Areas, West-Central Minnesota--Factors Related to Developing Water for Irrigation, W77-03335 4B

Appraisal of Water Resources in the Hackensack River Basin, New Jersey, W77-03336 2F

Plan of Study of the Hydrology of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming. W77-03338 4B

Summary of Geology and Ground-Water Resources of Passaic County, New Jersey, W77-03345 4B

Ground-Water Resources of Greeley and Wichita Counties, Western Kansas, W77-03347 4B

Water Management and Regulation of Water Use, W77-03525 6B

GROWING SEASON

Seasonal Demarcation in Pennsylvania for Hydrological Use, W77-03127 2B

GROWTH RATES

Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*), W77-03203 5C

Growth, Mortality and Production of *Brachysynodontis* *Batensoda* (Pisces, Mochocidae) in the Southeastern Archipelago of Lake Tchad, (In French), W77-03597 2H

GULF OF ALASKA

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas, W77-03239 5B

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B

Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska, W77-03245 2L

The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain, W77-03246 2L

Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf, W77-03248 2L

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L

Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska, W77-03258 2L

Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska, W77-03259 2L

Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

Faulting and Instability of Shelf Sediments - Western Gulf of Alaska, W77-03264 2L

A Historical Summary of Earthquake Epicenters in and Near Alaska, W77-03265 7C

GULF OF MEXICO

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida, W77-03304 2L

HABITATS

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

HACKENSACK RIVER BASIN (NJ)

Appraisal of Water Resources in the Hackensack River Basin, New Jersey, W77-03336 2F

HAIL

A Review of Hail-Measuring Instruments, W77-03101 2B

HAIL SENSORS

A Review of Hail-Measuring Instruments, W77-03101 2B

HATTERAS ABYSSAL PLAIN

The Bottom Boundary Layer of the Deep Ocean, W77-03089 2L

HAWAII

Annual Report, 1975-1976, (Hawaii Water Resources Research Center), W77-03165 9D

Calibration of Neutron Probe in Some Selected Hawaiian Soils, W77-03321 2G

HAZARDOUS MATERIALS

Degradation Mechanisms: Controlling the Bioaccumulation of Hazardous Materials, W77-03391 5B

HAZARDS

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases, W77-03240 5B

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B

SUBJECT INDEX

HYDROLOGY

- The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain, W77-03246 2L
- Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L
- Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L
- Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L
- Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska, W77-03259 2L
- Faulting and Instability of Shelf Sediments - Western Gulf of Alaska, W77-03264 2L
- A Historical Summary of Earthquake Epicenters in and Near Alaska, W77-03265 7C
- A Study of Beaufort Sea Coastal Erosion - Northern Alaska, W77-03266 2L
- Dynamics of Near-Shore Ice, W77-03268 2C
- Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C
- Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03272 2C
- Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03273 2C
- Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures, W77-03274 2C
- HEADGATES**
Head Gates; Powers of State Engineer. W77-03507 6E
- HEAT**
Heat Inactivation of Poliovirus in Waste Water Sludge, W77-03448 5C
- HEAVY METALS**
Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment, W77-03188 5B
- Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*), W77-03203 5C
- Heavy Metals in Lakes of the Coeur d'Alene River Valley, Idaho, W77-03207 5B
- Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas, W77-03222 5B
- Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L
- Reactions of Heavy Metals With Soils With Special Regard to Their Application in Sewage Wastes, W77-03359 5B
- HEAVY MINERAL DISTRIBUTION**
Relationships Between Sand Input from Rivers and the Composition of Sands from the Beaches of Southern California, W77-03324 2L
- HEAVY MINERALS**
Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L
- HERBICIDES**
Practical Alternatives to 2,4,5-T for Chemical Control of Brush Along Drainage Ditches and General Watershed Use, W77-03168 5G
- HERRING-BONE PATTERNS**
A 'Herring-Bone' Pattern of Possible Taylor-Gorter-Type Flow Origin Seen in Sonographs, W77-03253 5B
- HIGH WATER MARK**
Freedom of Beach, W77-03584 6E
- HISTORIC FLOODS**
Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois, W77-03175 4A
- Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico. W77-03176 4A
- Flood Plain Information: Metropolitan Region, Lincoln, Nebraska: Volume I, Summary Report; Salt Creek, Haines Branch and Beal Slough, Salt Creek Basin. W77-03179 4A
- HONEY LAKE VALLEY (CALIF)**
Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California. W77-03342 2K
- HOOD ARROYO (NM)**
Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico. W77-03176 4A
- HORTICULTURAL CROPS**
Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois, W77-03565 5A
- HOT SPRINGS**
Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California. W77-03342 2K
- HUMAN DISEASES**
Risk of Communicable Disease Infection Associated with Waste Water Irrigation in Agricultural Settlements, W77-03485 5C
- HUMAN POPULATIONS**
Water Resources of Australia and the Pattern of Population Concentrations, W77-03278 6D
- HYBRID COMPUTERS**
Use of Hybrid Computer Model in Resource Planning, W77-03523 6A
- HYDRAULIC DESIGN**
Cavitation From Surface Irregularities in High Velocity, W77-03082 8B
- Exact Solution of Gradually Varied Flow, W77-03085 8B
- HYDRAULIC GRADIENT**
Exact Solution of Gradually Varied Flow, W77-03085 8B
- HYDRAULIC PROPERTIES**
Hydraulic Characteristics of the Piney Point Aquifer and Overlying Confining Bed Near Dover, Delaware, W77-03331 2F
- HYDRAULIC STRUCTURES**
Piping in Earth Dams Constructed of Dispersive Clay; Literature Review and Design of Laboratory Tests, W77-03112 8D
- HYDRAULICS**
Minimum Unit Stream Power and Fluvial Hydraulics, W77-03080 8B
- Flow and Bed Topography in Curved Open Channels, W77-03084 8B
- Hydrologic Engineering Methods for Water Resources Development, Volume 6, Water Surface Profiles, W77-03105 8B
- HYDRODYNAMICS**
Hydrodynamic Forces on Multiple Circular Cylinders, W77-03081 8B
- Quadratic Finite Elements in Shallow Water Problems, W77-03083 8B
- HYDROGEOLOGY**
Hydrogeology of the Missouri River Flood Plain near Glasgow, Missouri, W77-03164 2F
- HYDROLOGIC BUDGET**
Water Management and Regulation of Water Use, W77-03525 6B
- Hydrologic Inventory of the San Rafael Study Unit, W77-03552 4A
- HYDROLOGIC DATA**
Retransmission of Hydrometric Data in Canada, W77-03111 7B
- Wet and Dry Periods of Annual Flow Series, W77-03319 2E
- HYDROLOGIC SYSTEMS**
Useful Modeling Concepts for the FCD Water System, W77-03524 6A
- HYDROLOGIC TRANSPORT MODELS**
OPTRM - A Hydrologic Transport Model With Parameter Optimization, W77-03115 5B
- HYDROLOGY**
Hydrologic Engineering Methods for Water Resources Development, Volume 6, Water Surface Profiles, W77-03105 8B

SUBJECT INDEX

HYDROLOGY

HYDROMETRIC DATA

Retransmission of Hydrometric Data in Canada, W77-03111 7B

HYPOTHETICAL FLOODS

Hydrologic Engineering Methods for Water Resources Development, Volume 5, Hypothetical Floods, W77-03104 8B

ICE

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

Strength of Ice Under Multiaxial Loading, W77-03301 2C

ICE BREAKUP

Breakup Flooding and Nutrient Source of Colville River Delta During 1973, W77-03388 5B

ICE CONDITIONS

Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study, W77-03275 2C

ICE COVER

Radio-Echo Layers and the Recent Stability of the West Antarctic Ice Sheet, W77-03100 2C

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L

ICE FORCES

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L

ICE JAMS

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire, W77-03177 4A

ICE SHEETS

Radio-Echo Layers and the Recent Stability of the West Antarctic Ice Sheet, W77-03100 2C

IDAHO

Publications List of the Idaho Water Resources Research Institute, W77-03154 10C

Heavy Metals in Lakes of the Coeur d'Alene River Valley, Idaho, W77-03207 5B

Bear River Evaluation Report, 1974 Survey, W77-03292 5B

Evaluation of Lake Milner Water Quality Model, W77-03373 5B

The Objectives, Part I of the State Water Plan, (Idaho Water Resources Board), W77-03544 6B

Idaho Environmental Overview, W77-03557 6G

ILLINOIS

The Illinois Coastal Zone Management Program: First Year Work Product. Volume II. Coastal Geological Studies, W77-03103 2H

Local Water Systems are Frequently Neglected, W77-03121 6B

Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois, W77-03175 4A

Depth and Frequency of Floods in Illinois, W77-03346 2E

Carlson V Village of Worth (Preemption of Local Regulation of Sanitary Landfill by Environmental Protection Act), W77-03497 6E

Village of Lombard V State Pollution Control Board (Pollution Control Board Without Authority to Impose Regionalization Upon Local Governmental Bodies), W77-03511 6E

Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois, W77-03565 5A

ILLINOIS RIVER

Environmental Inventory and Assessment of Navigation Pools 24, 25, and 26, Upper Mississippi and Lower Illinois Rivers; An Electrofishing Survey of the Illinois River, W77-03302 8I

IMPERIAL VALLEY (CALIF)

Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California, W77-03348 7C

IMPLICIT SCHEME

Quadratic Finite Elements in Shallow Water Problems, W77-03083 8B

INCINERATION

Combined Process of Pyrolysis and Combustion for Sludge Disposal, W77-03415 5D

Sludge Incineration, W77-03419 5E

Sewage Sludge Treatment System, W77-03487 5D

Fluidized Waste Incinerator and Method, W77-03489 5D

INDIAN OCEAN

Rainfall in the Seychelles 1941 to 1970, W77-03096 2B

INDIANA

Environmental Impact of Land Use on Water Quality, Progress Report, W77-03106 5G

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana, W77-03182 4A

INDUSTRIAL WASTES

Water Quality in the Calumet Area. Conference on Pollution of Lower Lake Michigan, Calumet River, Grand Calumet River, Little Calumet River, and Wolf Lake, Illinois and Indiana, W77-03382 5B

Aquatic Field Survey at Iowa Army Ammunition Plant, W77-03386 5C

Sludge Dewatering Pilot Plant Design, Part I, W77-03416 5D

Waste-Treatment 'Farm' Harvests Firms, W77-03420 5D

Proposed Toxic Pollutant Effluent Standards, W77-03529 5G

Implementing the National Water Pollution Control Permit Program: Progress and Problems, W77-03588 5G

The People's Lake, W77-03594 5G

INFECTION

Risk of Communicable Disease Infection Associated with Waste Water Irrigation in Agricultural Settlements, W77-03485 5C

INFILTRATION

Infiltration and Water Movement in an in Situ Swelling Soil During Prolonged Ponding, W77-03281 2G

Infiltration/Inflow Improvements in the Oyster Bay Sewer District, W77-03401 5D

Infiltration/Inflow - The Kansas Connection, W77-03479 5G

Conducting Sewer System Evaluations for Small Systems, W77-03581 5D

INFILTRATION/INFLOW

Infiltration/Inflow Improvements in the Oyster Bay Sewer District, W77-03401 5D

Infiltration/Inflow - The Kansas Connection, W77-03479 5G

Conducting Sewer System Evaluations for Small Systems, W77-03581 5D

INFLOW

Infiltration/Inflow Improvements in the Oyster Bay Sewer District, W77-03401 5D

Infiltration/Inflow - The Kansas Connection, W77-03479 5G

Conducting Sewer System Evaluations for Small Systems, W77-03581 5D

INFORMATION DISSEMINATION

1973 Western State Conference on Water Information Dissemination, W77-03166 10C

INFORMATION EXCHANGE

Publications List of the Idaho Water Resources Research Institute, W77-03154 10C

1973 Western State Conference on Water Information Dissemination, W77-03166 10C

INJUNCTIVE RELIEF

Clippinger V Birge (Riparian Rights in an Artificial Lake), W77-03512 6E

The People's Lake, W77-03594 5G

SUBJECT INDEX

KANSAS

INLAND WATERWAYS

- Hydrology and Environmental Aspects of Erie Canal (1817-99),
W77-03334 8B

INSPECTION

- Precautions to be Taken in the Construction and Maintenance of Water Supply and Sewer Systems (Precautions a Prendre Dans La Construction Et L'Entretien Des Reseaux D' Aqueduc Et D' Egout),
W77-03400 8G

INSTITUTIONAL CONFLICTS

- An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report.
W77-03157 6B

INSTITUTIONS

- Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I,
W77-03288 6E

INSTRUMENTATION

- Electronic Sensor for Low-to-Medium Wind speeds,
W77-03099 7B
- A Review of Hail-Measuring Instruments,
W77-03101 2B
- An Evaluation of Selected Instruments used to Measure the Moisture Content of Hardened Concrete,
W77-03295 8F
- Measurement of Nonexchanging Pores During Miscible Displacement in Soils,
W77-03320 2G
- Calibration of Neutron Probe in Some Selected Hawaiian Soils,
W77-03321 2G

INTERNATIONAL HYDROLOGICAL DECADE

- Hydrologic Engineering Methods for Water Resources Development, Volume 5, Hypothetical Floods,
W77-03104 8B

INTERNATIONAL JOINT COMMISSION

- Great Lakes Water Quality; Fourth Annual Report to the International Joint Commission.
W77-03383 5G

INTERNATIONAL LAW

- A Closer Look at Some Issues for Genera-Oceans Policy, Marine Environment, and Fisheries,
W77-03585 6E

INTERSTATE COMPACTS

- Great Lakes Compact Commission.
W77-03513 6E

INVESTMENT

- User Oriented Systems Analysis for Regional Municipal Water Supply Planning,
W77-03159 6A

ION EXCHANGE

- Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides,
W77-03132 5D
- Ammonia Removal from Wastewater by Ligand Exchange,
W77-03367 5D

ION TRANSPORT

- Studies on a Mechanism for Salt Rejection in Reverse Osmosis Membranes as a Guide to Improved Materials for Desalination of Sea Water.
W77-03290 3A

IONS

- Effects of Potassium on Adult Asiatic Clams, Corbicula Manilensis,
W77-03119 5C
- Stability of Ionic Proportions in Five Salt Lakes in Victoria, Australia,
W77-03285 2H
- Chemical Composition of Some Inland Surface Waters in South, Western, and Northern Australia,
W77-03286 2K
- Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in Anodonta Cygnea, (In Russian),
W77-03366 5C

IOWA

- Aquatic Field Survey at Iowa Army Ammunition Plant,
W77-03386 5C
- Projections of Population, Employment, Income and Water Use for Iowa River Basins, 1975-2020,
W77-03542 6D
- Iowa's Water Resources Program Progress and Needs.
W77-03547 6B
- Iowa Water Resources Framework Study Plan of Study.
W77-03561 6B

IRELAND

- Effects of Oil on Beaches in West Cork, Ireland,
W77-03192 5C
- The Effect of Oil Pollution in Bantry Bay,
W77-03194 5C

IRON

- Ductile Iron Pipe Solves a Tough Sewer Problem at Jimerson Creek,
W77-03398 8G

IRRIGATION

- The Effects of Sewage Effluent on Wetland Ecosystems,
W77-03354 5C
- Reactions of Heavy Metals With Soils With Special Regard to Their Application in Sewage Wastes,
W77-03359 5B
- Waste-Treatment 'Farm' Harvests Firms.
W77-03420 5D
- Irrigation Districts.
W77-03509 6E
- Vegetative Water Use in California, 1974,
W77-03554 3F

IRRIGATION DISTRICTS

- Irrigation Districts.
W77-03509 6E
- Irrigation Districts Powers and Purposes.
W77-03515 6E

IRRIGATION DITCHES

- Ditch Companies.
W77-03501 6E

IRRIGATION EFFECTS

- Soil Moisture Distribution Under Wide-Bed, Narrow-Row, and Conventional-Row Cotton,
W77-03137 3F
- Effect of Drought Stress Frequencies at Different Growth Stages on Corn Yield,
W77-03143 3F

IRRIGATION EFFICIENCY

- Soil Moisture Distribution Under Wide-Bed, Narrow-Row, and Conventional-Row Cotton,
W77-03137 3F

IRRIGATION OPERATION AND MAINTENANCE

- Irrigation Districts Powers and Purposes.
W77-03515 6E

IRRIGATION PRACTICES

- Soil Moisture Distribution Under Wide-Bed, Narrow-Row, and Conventional-Row Cotton,
W77-03137 3F
- Effect of Drought Stress Frequencies at Different Growth Stages on Corn Yield,
W77-03143 3F

- Aerosol Production by Irrigation Equipment Used for Land Application of Waste Water,
W77-03484 5A

IRRIGATION SYSTEMS

- Aerosol Production by Irrigation Equipment Used for Land Application of Waste Water,
W77-03484 5A

IRRIGATION WATER

- Suitability of Lagoon Effluents for Irrigation in South Dakota,
W77-03152 5D
- Talley V Carley (Priorities to Water in 1963 Amendment to 82 Oklahoma Statutes Annotated Section 1-A).
W77-03521 6E

IRRIGATION WELLS

- A Computer Program for Estimating Costs of Owning and Operating an Irrigation Well Under Conditions of Declining Water Levels,
W77-03211 6C

- Buried Aquifers in the Brooten-Belgrade and Lake Emily Areas, West-Central Minnesota--Factors Related to Developing Water for Irrigation,
W77-03335 4B

JONES ACT

- Unions Fight a Jones Act Waiver.
W77-03532 6E

JUDICIAL DECISIONS

- Clippinger V Birge (Riparian Rights in an Artificial Lake).
W77-03512 6E
- The People's Lake,
W77-03594 5G

KANSAS

- Ground-Water Resources of Greeley and Wichita Counties, Western Kansas,
W77-03347 4B
- Infiltration/Inflow - The Kansas Connection,
W77-03479 5G

SUBJECT INDEX

KARMAN INTEGRAL METHOD

KARMAN INTEGRAL METHOD

Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A

KASKASKIA RIVER (IL)

Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois, W77-03175 4A

KELPS

The Effect of Oil Pollution in Bantry Bay, W77-03194 5C
Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

KENTUCKY

Biological and Chemical Evaluation of the Aquatic Environment of Selected Undeveloped Kentucky Lake Embayments, W77-03209 5C

KINETICS

Design and Control of Nitrifying Activated Sludge Systems, W77-03426 5D

KINETICS OF ADSORPTION

The Kinetics of Adsorption of Phenols by Granular Activated Carbon, W77-03149 5D

KOKOMO CREEK (IN)

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana, W77-03182 4A

KOREA

Experimental Studies on the Second Intermediate Hosts of Clonorchis Sinesis: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of Metacercariae of Clonorchis Sinesis in Fresh-water Fish, (In Korean), W77-03161 5C

LA PLATA RIVER (NM)

Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico, W77-03176 4A

LABORATORY TESTS

Strength of Ice Under Multiaxial Loading, W77-03301 2C

Biochemical Mechanisms in the Methane Fermentation of Glutamic and Oleic Acids, W77-03441 5D

Laboratory Studies on the Effects of Temperature on Accumulation of Solids in Biological Filters, W77-03464 5D

LACTIC ACID

Fermentation of Waste Materials to Produce Industrial Intermediates, W77-03563 5D

LAGOONS

Plankton of Coastal Lagoons: XI. Transport in Three Estuaries of the Northwest of Mexico (November, 1973) (In Spanish), W77-03145 2L

LAKE CHAD

Growth, Mortality and Production of Brachysynodontis Batensoda (Pisces,

Mochocidae) in the Southeastern Archipelago of Lake Tchad, (In French), W77-03597 2H

LAKE CHIPPEWA (WISC)

Probable Maximum Flood at Lake Chippewa near Winter, Wisconsin, W77-03349 4A

LAKE COLUMBIA (WISC)

Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin, W77-03077 5C

Distribution and Feeding of Pumpkinseed (Lepomis gibbosus) and Black Crappie (Pomoxis nigromaculatus) in a power plant cooling lake, W77-03078 5C

LAKE ERIE

Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota, W77-03094 5C

Nature and Genesis of Some Storm Washover Deposits, W77-03293 2L

Hydrology and Environmental Aspects of Erie Canal (1817-99), W77-03334 8B

The Hard Job of Saving Lake Erie, W77-03534 5G

LAKE GEORGE (NY)

Precipitation Chemistry Studies at Lake George: Acid Rains, W77-03098 5A

LAKE HURON

Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A

LAKE JEZIORAK (POLAND)

The Primary Production of the Periphyton Association Oedogonio-Epithemietum Litoralae, W77-03374 5C

LAKE MEAD (NEV)

Report on Pollution in Las Vegas Wash and Las Vegas Bay, W77-03371 5C

LAKE MICHIGAN

Beach Processes, Perrien County, Michigan, W77-03095 2J

The Illinois Coastal Zone Management Program: First Year Work Product. Volume II. Coastal Geological Studies, W77-03103 2H

Water Quality in the Calumet Area. Conference on Pollution of Lower Lake Michigan, Calumet River, Grand Calumet River, Little Calumet River, and Wolf Lake, Illinois and Indiana, W77-03382 5B

Phytoplankton Response to Phosphorus and Silica Enrichments in Lake Michigan, W77-03537 5C

Environmental Status of the Lake Michigan Region. Vol. 17. Inland Fishes of the Lake Michigan Drainage Basin, W77-03566 6G

LAKE MILNER (IDAHO)

Evaluation of Lake Milner Water Quality Model, W77-03373 5B

LAKE OF GENEVA (SWITZ)

Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French), W77-03144 5C

LAKE RESTORATION

Silt Removal from a Lake Bottom, W77-03392 5C

Eutrophication and Restoration of Lakes Receiving Nutrients from Diffuse Sources Only, W77-03536 5C

LAKE SEDIMENTS

Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota, W77-03094 5C

Silt Removal from a Lake Bottom, W77-03392 5C

LAKE SIBAYA (SOUTH AFRICA)

The Primary Production of Lake Sibaya, Kwazulu, South Africa, W77-03376 5C

LAKE SUPERIOR

Coastal Region Residence Time Estimates from Concentration Gradients, W77-03093 5C

The People's Lake, W77-03594 5G

LAKE TYNWALD (POLAND)

The Primary Production of the Periphyton Association Oedogonio-Epithemietum Litoralae, W77-03374 5C

LAKE

Coastal Region Residence Time Estimates from Concentration Gradients, W77-03093 5C

Organic Phosphorus in Lakes, W77-03210 5C

Wind-Induced Water Level Oscillations in Shallow Lagoons, W77-03287 2H

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

Allatoona Lake, Destratification Equipment Test Report, W77-03306 5G

Probable Maximum Flood at Lake Chippewa near Winter, Wisconsin, W77-03349 4A

Data on Selected Lakes in Washington, Part 5, W77-03350 7C

The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota, W77-03375 5B

The Aerial Photo-Water Quality Link, W77-03471 5A

SUBJECT INDEX

LINEAR PROGRAMMING

Public Inland Lake Protection and Rehabilitation.
W77-03510 6E

Water Quality, Plankton and Eutrophication of Bergsvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian),
W77-03595 5C

LANCASHIRE

Surf-Zone Water Quality in Liverpool Bay,
W77-03092 5B

LAND APPLICATION

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method,
W77-03147 5D

Field Monitoring Techniques and Data Analysis,
W77-03150 5A

LAND RECLAMATION

California Water Project: Law and Politics,
W77-03583 6E

LAND TENURE

California Water Project: Law and Politics,
W77-03583 6E

LAND USE

Environmental Impact of Land Use on Water Quality, Progress Report,
W77-03106 5G

Concentric Waste-Treatment Plant Saves Land, Cuts Cost,
W77-03427 5D

LANDFAST ICE

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice,
W77-03271 2L

LANDFILLS

Carlson V Village of Worth (Preemption of Local Regulation of Sanitary Landfill by Environmental Protection Act).
W77-03497 6E

LANDSAT

Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data,
W77-03305 5A

LARVAE

Effects on Fertilization and Development of the Common Mussel, *Mytilus Edulis* After Long-Term Exposure to a Nonionic Surfactant,
W77-03198 5C

LARVAL

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory,
W77-03197 5C

LARVAL GROWTH STAGE

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory,
W77-03197 5C

Effects on Fertilization and Development of the Common Mussel, *Mytilus Edulis* After Long-Term Exposure to a Nonionic Surfactant,
W77-03198 5C

LAW ENFORCEMENT

Freedom of Beach,
W77-03584 6E

LAW OF THE SEA

A Sweeping Sea Law in 1976.
W77-03533 6E

A Closer Look at Some Issues for General Oceans Policy, Marine Environment, and Fisheries,
W77-03585 6E

Coming Showdown: Ocean Nationalism and the Senate 200-Mile Shelf Bill,
W77-03591 6E

LAW OF THE SEAS CONFERENCE

A Closer Look at Some Issues for General Oceans Policy, Marine Environment, and Fisheries,
W77-03585 6E

LEAF WATER POTENTIAL

Water Stress Induced Alterations of the Stomatal Response to Decreases in Leaf Water Potential,
W77-03140 2I

Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matrix Potential and Microclimate,
W77-03394 3F

LEAVES

Changes in the Transpiration Rate and Leaf Water Content in Several Varieties of *Cryptomeria Japonica* Subjected to Water Stress, (In Japanese),
W77-03155 2D

LEGAL ASPECTS

The Legal Framework for Public Participation in Canadian Water Management,
W77-03543 6E

Coming Showdown: Ocean Nationalism and the Senate 200-Mile Shelf Bill,
W77-03591 6E

Water Rights,
W77-03599 6E

LEGAL REVIEW

State Dept of Pollution Control V International Paper Co. (Determination of Fish Value That were Killed by Pollutants).
W77-03498 6E

Village of Lombard V State Pollution Control Board (Pollution Control Board Without Authority to Impose Regionalization Upon Local Governmental Bodies).
W77-03511 6E

LEGISLATION

National Safe Drinking Water Strategy, One Step at a Time.
W77-03357 5G

Water Rights and Liens.
W77-03499 6E

1971 Shoreline Management Act.
W77-03514 6E

Unions Fight a Jones Act Waiver.
W77-03532 6E

The Cost of Coastal Zoning.
W77-03535 6E

The Muddy Road to Clean Water,
W77-03587 5G

Water Rights,
W77-03599 6E

LENT SQUARES METHOD

The Unit Hydrograph: A Satisfactory Model of Watershed Response,
W77-03126 4D

LETHAL LIMIT

Hygienic Substantiation of the Maximum Permissible Concentration of Tin Tributylmethacrylate in Water Bodies, (In Russian),
W77-03107 5A

Permissible Level of Benzo(A)Plyrene in Water Bodies, (In Russian),
W77-03117 5B

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory,
W77-03197 5C

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*),
W77-03204 5C

Experimental Substantiation of the Maximal Permissible Concentrations of Triethanolamine, Ammonium and Calcium Salts of Alkylbenzenesulfates in Water Bodies, (In Russian),
W77-03586 5B

LEVEES

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana.
W77-03182 4A

Plan for Improvement of the Delta Levees.
W77-03550 4A

LICHENS

The Effect of Oil Pollution in Bantry Bay,
W77-03194 5C

LICHNENS

Effects of Oil on Beaches in West Cork, Ireland,
W77-03192 5C

LIENS

Water Rights and Liens.
W77-03499 6E

LIGAND EXCHANGE

Ammonia Removal from Wastewater by Ligand Exchange,
W77-03367 5D

LIGHT PENETRATION

Measurement of 'Turbidity' and Related Characteristics of Natural Waters,
W77-03339 7B

LIME

Specific Role of Lime in Municipal Waste Water Treatment-Expectations and Reality (Die Spezifische Rolle Des Kalks in Der Kommunalen Abwasserreinigung-Erwartungen Und Realitaeten),
W77-03422 5D

LIMULUS ASSAY

Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water,
W77-03474 5A

LINEAR PROGRAMMING

User Oriented Systems Analysis for Regional Municipal Water Supply Planning,
W77-03159 6A

SUBJECT INDEX

LIQUID WASTES

LIQUID WASTES

Sewage Sludge Treatment System,
W77-03487

5D

LITTER

Litter and Oil on the Shores of Utsira, Rogaland County, During Autumn 1974, (In Danish),
W77-03125

5B

LITTLE SALT CREEK (NB)

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin.
W77-03181

4A

LIVERPOOL BAY

Surf-Zone Water Quality in Liverpool Bay,
W77-03092

5B

LOBSTER

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory,
W77-03197

5C

LOCAL GOVERNMENTS

Village of Lombard V State Pollution Control Board (Pollution Control Board Without Authority to Impose Regionalization Upon Local Governmental Bodies).
W77-03511

6E

Waterway Districts.

W77-03516

6E

LOCAL PLANNING

Local Water Systems are Frequently Neglected,
W77-03121

6B

LONG ISLAND SOUND

Seasonal Variation of Residual Drift in Long Island Sound,
W77-03322

2L

Sediment Mass Balance of a Large Estuary, Long Island Sound,
W77-03323

2L

LOS ANGELES (CALIF)

Land Based Sewage Sludge Management Alternatives for Los Angeles: Evaluation and Comparison,
W77-03289

5D

LOUISIANA

Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens,
W77-03590

6G

LOW FLOW

Low Flow Modeling in Small Steep Watersheds,
W77-03316

4D

LUMBER

Floating Timber on Streams.
W77-03492

6E

LUMBERING

Floating Timber on Streams.
W77-03492

6E

LYSIMETER

Computation of the Potential Evapotranspiration and Their Comparison with Values of the Actual Evapotranspiration of Lysimeters, (In German),
W77-03118

2D

M.S.222

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*),
W77-03204

5C

MACOMA BALTHICA

Macoma Balthica: An Indicator of Oil Pollution,
W77-03185

5A

MADISON AQUIFER (WYO)

Permeability and Ground Water Circulation in the Madison Aquifer Along the Eastern Flank of the Bighorn Mountains of Wyoming,
W77-03122

2F

MADISON LIMESTONE

Plan of Study of the Hydrology of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming.
W77-03338

4B

MAGNETIC FILTRATION

High Gradient Magnetic Filtration,
W77-03418

5D

MAHE

Rainfall in the Seychelles 1941 to 1970,
W77-03096

2B

MAINE

Effect of Zinc-Coated Culverts on Vertebrate and Invertebrate Fauna in Selected Maine Streams,
W77-03170

5C

MAINTENANCE

Precautions to be Taken in the Construction and Maintenance of Water Supply and Sewer Systems (Precautions a Prendre Dans La Construction Et L'Entretien Des Reseaux D' Aqueduc Et D' Egout),
W77-03400

8G

MANAGEMENT

Local Water Systems are Frequently Neglected,
W77-03121

6B

MANGANESE

A Model for the Control of Dissolved Manganese in the Interstitial Waters of Chesapeake Bay,
W77-03556

5B

MANHOLES

Innovations in Sewer Design and Construction,
W77-03399

8G

MAPPING

STD Mappings of the Beaufort Sea Shelf,
W77-03233

2L

National Program for Managing Flood Losses: Guidelines for Preparation, Transmittal, and Distribution of Flood-Prone Area Maps and Pamphlets,
W77-03341

7C

MAPS

Measured and Simulated Ground-Water Levels in the Franklin Area, Southeastern Virginia,
W77-03326

7C

Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico--1975,
W77-03327

7C

Maps Showing Ground-Water Conditions in the San Bernardino Valley Area Cochise County, Arizona--1975,
W77-03328

7C

National Program for Managing Flood Losses: Guidelines for Preparation, Transmittal, and Distribution of Flood-Prone Area Maps and Pamphlets,
W77-03341

7C

MARICULTURE

Northwest Mariculture Laws,
W77-03598

6E

MARINE ALGAE

Effects of Oil on Beaches in West Cork, Ireland,
W77-03192

5C

Influence of Illumination on Phytotoxicity of Crude Oil,
W77-03193

5C

The Effect of Oil Pollution in Bantry Bay,
W77-03194

5C

MARINE ANIMAL

Effects of Oil Pollution on Breeding Grey Seals,
W77-03187

5C

MARINE ANIMALS

Toxicity of Crude Oils and a Dispersant to the Stony Coral *Madracis Mirabilis*,
W77-03196

5C

Northwest Mariculture Laws,
W77-03598

6E

MARINE AQUACULTURE

Northwest Mariculture Laws,
W77-03598

6E

MARINE BIOLOGY

Winter Conditions in the New York Bight, 1973-1974.
W77-03380

5C

MARINE FISH

Northwest Mariculture Laws,
W77-03598

6E

MARINE FISHERIES

Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp,
W77-03186

5C

MARINE PLANKTON

Influence of Illumination on Phytotoxicity of Crude Oil,
W77-03193

5C

MARINE PLANTS

Feasibility of Transplantation, Revegetation, and Restoration of Eelgrass in San Diego Bay, California,
W77-03546

5G

MARYLAND

Assateague Ecological Studies.
W77-03381

5C

MASSACHUSETTS

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts.
W77-03178

4A

MAST PRODUCTION

Experimental Ecology of Selected Vertebrate Species,
W77-03564

6G

SUBJECT INDEX

MICROBIOLOGY

MATHEMATICAL MODELS

A Three-Dimensional Finite Element Ground Water Model, W77-03109 2F

Hydrogeology of the Missouri River Flood Plain near Glasgow, Missouri, W77-03164 2F

Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function, W77-03315 2G

Landslide Generated Water Wave Model, W77-03318 8B

A Study of Substrate Removal in a Microbial Film Reactor, W77-03480 5D

MATHEMATICAL STUDIES

Hydrodynamic Forces on Multiple Circular Cylinders, W77-03081 8B

On the Validity of the Theory of Flow in Saturated Swelling Materials, W77-03280 2G

MAUMEE RIVER BASIN (IND)

Environmental Impact of Land Use on Water Quality, Progress Report, W77-03106 5G

MAXIMUM PROBABLE FLOOD

Probable Maximum Flood at Lake Chippewa near Winter, Wisconsin, W77-03349 4A

MEANDER LAKE (MINN)

The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota, W77-03375 5B

MEASUREMENT

A Review of Hail-Measuring Instruments, W77-03101 2B

Calibration of Neutron Probe in Some Selected Hawaiian Soils, W77-03321 2G

A Cine-Camera Technique for Process Measurement on a Ridge and Runnel Beach, W77-03325 2L

The Electrolytic Respirometer - I. Factors Affecting Oxygen Uptake Measurements, W77-03457 5A

MECHANICAL CONTROL

Head Gates; Powers of State Engineer, W77-03507 6E

MECHANICAL TREATMENT (WASTES)

Comparative Assessment of the Effectiveness of Certain Methods Making Industrial Effluents Noncarcinogenic, (In Russian), W77-03488 5D

MEMBRANE PROCESSES

One Pass Seawater Desalting RO Pilot Plant Evaluation, W77-03076 3A

Studies on a Mechanism for Salt Rejection in Reverse Osmosis Membranes as a Guide to Improved Materials for Desalination of Sea Water, W77-03290 3A

MEMBRANES

Studies on a Mechanism for Salt Rejection in Reverse Osmosis Membranes as a Guide to Improved Materials for Desalination of Sea Water, W77-03290 3A

MERCURY

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*, W77-03184 5C

Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment, W77-03188 5B

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples, W77-03202 5A

MERSEY RIVER

Surf-Zone Water Quality in Liverpool Bay, W77-03092 5B

MESOPHYL

Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions, W77-03142 2D

MESOSCALE

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary, W77-03212 3B

METABOLISM

Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in *Anodonta Cygnea*, (In Russian), W77-03366 5C

METACERCARIAE

Experimental Studies on the Second Intermediate Hosts of *Clonorchis Sinensis*: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of Metacercariae of *Clonorchis Sinensis* in Freshwater Fish, (In Korean), W77-03161 5C

METAL IONS

Effects of Potassium on Adult Asiatic Clams, *Corbicula Manilensis*, W77-03119 5C

METALS

Organic Phosphorus in Lakes, W77-03210 5C

METEOROLOGIC DATA

Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C

METEOROLOGICAL DATA

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases, W77-03240 5B

Near-Shore Atmospheric Modification, W77-03242 5B

METEOROLOGY

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume I - Meteorology and Hydrology of the Northern Sierra Nevada, Final Report, W77-03213 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume II - Physical and Statistical Design, Final Report, W77-03214 3B

METHACRYLATES

Hygienic Substantiation of the Maximum Permissible Concentration of Tin Tributylmethacrylate in Water Bodies, (In Russian), W77-03107 5A

METHANE

Biochemical Mechanisms in the Methane Fermentation of Glutamic and Oleic Acids, W77-03441 5D

METHODOLOGY

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples, W77-03202 5A

Methods of Dissolved Oxygen Budget Analysis for Assessing Effects of Dredged Material Disposal on Biological Community Metabolism, W77-03393 5C

Nature Preservation Activity RR Investigation: Part 6. A Modified Method of Measuring the Chemical Oxygen Demand Gives a High Analytical Capacity, (In Swedish), W77-03589 5A

METHYLMERCURY

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples, W77-03202 5A

MEXICO

Plankton of Coastal Lagoons: XI. Transport in Three Estuaries of the Northwest of Mexico (November, 1973) (In Spanish), W77-03145 2L

MICHIGAN

Beach Processes, Perrien County, Michigan, W77-03095 2J

Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A

The Effects of Sewage Effluent on Wetland Ecosystems, W77-03354 5C

Investigations on the Role of Dissolved Organic Matter in Determining Ecosystem Structure and Function: The Plankton and Photoheterotrophy, W77-03389 5C

Response of *Daphnia* Population Size and Age Structure to Predation, W77-03390 2H

MICROBIAL DEGRADATION

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

MICROBIOLOGY

The Influence of Carbon-Nitrogen Ratio on the Chlorination of Microbial Aggregates, W77-03414 5D

SUBJECT INDEX

MICROCLIMATOLOGY

MICROCLIMATOLOGY

- Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matric Potential and Microclimate, W77-03394 3F

MICROFLOTATION

- Flotation for Water and Wastewater Treatment, W77-03576 5D

MICROORGANISMS

- Sanitary-Bacteriological Study of the Effectiveness of Decontaminating the Sewage of Voroshilovgrad on Sewage Farms, (In Russian), W77-03128 5D

- Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea, W77-03217 5C

- Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska, W77-03218 5C

- Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A

- Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

- A Study of Substrate Removal in a Microbial Film Reactor, W77-03480 5D

MIDDLE CREEK (NB)

- Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume II, Summary Report, Antelope Creek, Dead Mans Run, and Middle Creek, Salt Creek Basin, W77-03180 4A

MINE DRAINAGE

- Commonwealth V. Barnes and Tucker Company (Public Nuisance of Acid Mine Drainage), W77-03519 6E

MINE WASTES

- Hydrologic Studies by the U.S. Geological Survey in Oil-Shale Areas of Colorado, Utah, and Wyoming, 1976, W77-03340 4B

- Commonwealth V. Barnes and Tucker Company (Public Nuisance of Acid Mine Drainage), W77-03519 6E

MINERALIZATION

- Effect of Added Salts on Nitrogen Released and Nitrate Levels in Forest Soils of the Washington Coastal Area, W77-03396 2G

MINERALOGY

- Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L

MINING WASTES

- Heavy Metals in Lakes of the Coeur d'Alene River Valley, Idaho, W77-03207 5B

MINNESOTA

- Buried Aquifers in the Broosten-Belgrade and Lake Emily Areas, West-Central Minnesota--Factors Related to Developing Water for Irrigation, W77-03335 4B

- The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota, W77-03375 5B

- The People's Lake, W77-03594 5G

MISCIBLE DISPLACEMENT

- Measurement of Nonexchanging Pores During Miscible Displacement in Soils, W77-03320 2G

MISSISSIPPI RIVER

- Environmental Inventory and Assessment of Navigation Pools 24, 25, and 26, Upper Mississippi and Lower Illinois Rivers; An Electrofishing Survey of the Illinois River, W77-03302 8I

MISSOURI

- Relation Between Atmospheric Pollution, Precipitation, and Streamwater Quality Near A Large Urban-Industrial Complex, W77-03097 5B

- Hydrogeology of the Missouri River Flood Plain near Glasgow, Missouri, W77-03164 2F

MISSOURI RIVER

- Hydrogeology of the Missouri River Flood Plain near Glasgow, Missouri, W77-03164 2F

- Water Pollution Surveillance in the United States. Report Number 1, Missouri River Main Stem, 1958-1962, W77-03379 5A

MIXING

- Current Structure and Mixing in the Shelf/Slope Water Front South of New England, W77-03087 2L

- A Study of Mixing Characteristics of Sewage Stabilization Ponds with Radioactive Tracers, W77-03461 5D

- Removal of BOD and Nitrogenous Pollutants from Wastewaters, W77-03486 5D

MOBILE FACILITIES

- Investigation of the Physical Feasibility of Mobile Fish Processing Plants, W77-03558 6B

MOCHOCIDAE

- Growth, Mortality and Production of Brachysynodontis Batensoda (Pisces, Mochocidae) in the Southeastern Archipelago of Lake Tchad, (In French), W77-03597 2H

MODE OF ACTION

- Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (Salmo Gairdneri), W77-03204 5C

MODEL STUDIES

- Beach Processes, Perrien County, Michigan, W77-03095 2J

- Radio-Echo Layers and the Recent Stability of the West Antarctic Ice Sheet, W77-03100 2C

- OPTRM - A Hydrologic Transport Model With Parameter Optimization, W77-03115 5B

- The Unit Hydrograph: A Satisfactory Model of Watershed Response, W77-03126 4D

- Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A

- Application of a Model for Layout and Design of Sewer Systems, W77-03133 5B

- A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03151 4A

- Dynamic Response of Final Settling Tanks to Transient Loading Conditions, W77-03156 5D

- Calibration of a Thermal Enrichment Model for Shallow, Barricaded Estuaries, W77-03171 5B

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume I - Meteorology and Hydrology of the Northern Sierra Nevada, Final Report, W77-03213 3B

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume II - Physical and Statistical Design, Final Report, W77-03214 3B

- Effects of a Breakwater on Nearshore Currents Due to Breaking Waves, W77-03297 8B

- Allatoona Lake, Destratification Equipment Test, Appendix D, Effects of Artificial Destratification on Temperature and Dissolved Oxygen in Allatoona Reservoir, W77-03310 5G

- Salinity Induced Horizontal Estuarine Circulation, W77-03312 2L

- Measured and Simulated Ground-Water Levels in the Franklin Area, Southeastern Virginia, W77-03326 7C

- Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices, W77-03351 5A

- Response of Daphnia Population Size and Age Structure to Predation, W77-03390 2H

- Use of Hybrid Computer Model in Resource Planning, W77-03523 6A

- A Model for the Control of Dissolved Manganese in the Interstitial Waters of Chesapeake Bay, W77-03556 5B

SUBJECT INDEX

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

MOISTURE CONTENT

Soil Moisture Distribution Under Wide-Bed, Narrow-Row, and Conventional-Row Cotton, W77-03137 3F

Comparative Photosynthetic Production of Mojave Desert Shrubs, W77-03141 2D

Changes in the Transpiration Rate and Leaf Water Content in Several Varieties of *Cryptomeria Japonica* Subjected to Water Stress, (In Japanese), W77-03155 2D

An Evaluation of Selected Instruments used to Measure the Moisture Content of Hardened Concrete, W77-03295 8F

MOISTURE DEFICIT

Water Stress Induced Alterations of the Stomatal Response to Decreases in Leaf Water Potential, W77-03140 2I

MOISTURE STRESS

Effect of Water Stress on the Phasic Development of Annual Medicago Species, W77-03136 2I

Water Stress Induced Alterations of the Stomatal Response to Decreases in Leaf Water Potential, W77-03140 2I

Effect of Drought Stress Frequencies at Different Growth Stages on Corn Yield, W77-03143 3F

Effects of Soil-Moisture Regimes on the Growth of Barley, W77-03216 3F

Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matric Potential and Microclimate, W77-03394 3F

MOISTURE TENSION

Water Stress Induced Alterations of the Stomatal Response to Decreases in Leaf Water Potential, W77-03140 2I

Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matric Potential and Microclimate, W77-03394 3F

MOJAVE DESERT SHRUBS

A Comparison of Seasonal Primary Production of Mojave Desert Shrubs During Wet and Dry Years, W77-03138 2I

MOLLUSKS

Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in *Anodonta Cygnea*, (In Russian), W77-03366 5C

MONITORING

Field Monitoring Techniques and Data Analysis, W77-03150 5A

Hydrogeology of the Missouri River Flood Plain near Glasgow, Missouri, W77-03164 2F

Methods of Dissolved Oxygen Budget Analysis for Assessing Effects of Dredged Material Disposal on Biological Community Metabolism, W77-03393 5C

Mussel Test for Biological Control of Water Pollution (Kagyló-teszt vizsennyezések biológiai hatástanak vizsgálatára), W77-03454 5A

Cyanophage Analysis as a Biological Pollution Indicator-Bacterial and Viral, W77-03460 5A

Use of Intrinsically Safe Instrumentation, W77-03462 5A

Monitoring of Community Water Supplies, W77-03463 5A

Ultraviolet Purification System, W77-03467 5A

MONTANA

Landslide Generated Water Wave Model, W77-03318 8B

Plan of Study of the Hydrology of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming, W77-03338 4B

MORTALITIES

Macoma Balthica: An Indicator of Oil Pollution, W77-03185 5A

MORTALITY

Effects of Oil on Beaches in West Cork, Ireland, W77-03192 5C

Growth, Mortality and Production of *Brachysynodontis Batensoda* (Pisces, Mochocidae) in the Southeastern Archipelago of Lake Tchad, (In French), W77-03597 2H

MUD-WATER INTERFACES

Experimental Studies on Material Transactions Between Mud and Water of the Gnadensee, W77-03370 5C

MULLUSKS

Macoma Balthica: An Indicator of Oil Pollution, W77-03185 5A

MULTIAXIAL LOADING

Strength of Ice Under Multiaxial Loading, W77-03301 2C

MULTIPLE PURPOSE PROJECTS

Flood Control Projects and Drought Emergencies, W77-03505 6E

The California State Water Project in 1975, W77-03551 6B

MULTIPLE USE

Multiple Use in the Southern Coastal Plains in the United States, W77-03173 4C

MULTIPLE USE MANAGEMENT

Multiple Use in the Southern Coastal Plains in the United States, W77-03173 4C

MUNICIPAL WASTE WATER

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides, W77-03132 5D

MUNICIPAL WASTES

Field Monitoring Techniques and Data Analysis, W77-03150 5A

Land Based Sewage Sludge Management Alternatives for Los Angeles: Evaluation and Comparison, W77-03289 5D

Research Needs for the Potable Reuse of Municipal Wastewater, W77-03356 5D

Ammonia Removal from Wastewater by Ligand Exchange, W77-03367 5D

Denver's Headworks Reflects Complexity of System, W77-03412 5D

Waste-Treatment 'Farm' Harvests Firms, W77-03420 5D

Specific Role of Lime in Municipal Waste Water Treatment-Expectations and Reality (Die Spezifische Rolle Des Kalks in Der Kommunalen Abwasserreinigung-Erwartungen Und Realitaeten), W77-03422 5D

Model Studies in Aqueous Chlorination: The Chlorination of Phenols in Dilute Aqueous Solutions, W77-03458 5A

MUNICIPAL WASTEWATER

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

MUNICIPAL WATER

Local Water Systems are Frequently Neglected, W77-03121 6B

User Oriented Systems Analysis for Regional Municipal Water Supply Planning, W77-03159 6A

MUSSELS

Effects on Fertilization and Development of the Common Mussel, *Mytilus Edulis* After Long-Term Exposure to a Nonionic Surfactant, W77-03198 5C

Mussel Test for Biological Control of Water Pollution (Kagyló-teszt vizsennyezések biológiai hatástanak vizsgálatára), W77-03454 5A

NATIONAL POLLUTANT DISCHARGE

ELIMINATION SYSTEM

Virginia State Program for Control of Discharge of Pollutants to Navigable Waters; Approval, W77-03527 5G

NATIONAL POLLUTANT DISCHARGE

ELIMINATION SYSTEM (NPDES)

Implementing the National Water Pollution Control Permit Program: Progress and Problems, W77-03588 5G

SUBJECT INDEX

NAVIGABLE WATERS

NAVIGABLE WATERS

Providence and Worcester Company V. Exxon Corporation (Right-of-Way in Land Submerged in Tidewater).
W77-03496

6E

NEBRASKA

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska: Volume I, Summary Report; Salt Creek, Haines Branch and Beal Slough, Salt Creek Basin.
W77-03179

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume II, Summary Report, Antelope Creek, Dead Mans Run, and Middle Creek, Salt Creek Basin.
W77-03180

4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin.
W77-03181

4A

Plan of Study of the Hydrology of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming.
W77-03338

4B

NEONATES

Significance of Nitrates in Drinking Water, (In Russian),
W77-03541

5B

NEUSE RIVER (NC)

Flow Dynamics of the Neuse River Estuary,
W77-03300

2L

NEUTRON ABSORPTION

Calibration of Neutron Probe in Some Selected Hawaiian Soils,
W77-03321

2G

NEUTRON ACTIVATION ANALYSIS

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples,
W77-03202

5A

NEUTRON PROBES

Calibration of Neutron Probe in Some Selected Hawaiian Soils,
W77-03321

2G

NEVADA

Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices,
W77-03351

5A

Report on Pollution in Las Vegas Wash and Las Vegas Bay.
W77-03371

5C

Water for Nevada. Water Planning Report.
W77-03545

6B

NEVADA STATE WATER PLAN

Water for Nevada. Water Planning Report.
W77-03545

6B

NEW HAMPSHIRE

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire.
W77-03177

4A

NEW JERSEY

Appraisal of Water Resources in the Hackensack River Basin, New Jersey,
W77-03336

2F

Summary of Geology and Ground-Water Resources of Passaic County, New Jersey,
W77-03345

4B

NEW MEXICO

Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico.
W77-03176

4A

Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico--1975,
W77-03327

7C

Ground-Water Levels in New Mexico, 1975,
W77-03330

7C

NEW YORK

Precipitation Chemistry Studies at Lake George: Acid Rains,
W77-03098

5A

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York,
W77-03337

4A

Infiltration/Inflow Improvements in the Oyster Bay Sewer District,
W77-03401

5D

NEW YORK BIGHT

Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography.
W77-03358

5B

Winter Conditions in the New York Bight, 1973-1974.
W77-03380

5C

NEW YORK HARBOR

Variations of Coliform Bacteria and Other Pollution Indices in Surface Waters.
W77-03539

5B

NICKEL

Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment,
W77-03188

5B

NICKEL REFINERY

Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment,
W77-03188

5B

NITROGEN

Treatment of Livestock Wastes by a Barrired Landscape Water Renovation System,
W77-03116

5D

NITRATES

Effect of Added Salts on Nitrogen Released and Nitrate Levels in Forest Soils of the Washington Coastal Area,
W77-03396

2G

A New Method of Automatic Determination of Nitrate in Waste Waters and Polluted Surface Waters (Ein Neues Verfahren Zur Automatischen Nitrat-Bestimmung in Abwaessern und Belasteten Oberflaechenwaessern),
W77-03466

5A

Nitrate Monitoring.
W77-03468

5A

Significance of Nitrates in Drinking Water, (In Russian),
W77-03541

5B

NITRIFICATION

Activated Sludge Waste Water Treatment Process - Using Succession of Aerobic and Anaerobic Zones to Remove Nitrogenous Material.
W77-03402

5D

Dorr-Oliver to Market Ecolotrol Waste Water Treatment Process.
W77-03417

5D

Origin of Nitrogen Pollution in Surface and Waste Waters (Origines Des Pollutions Azotes Dans Les Eaux Superficielles Et Les Eaux Usees),
W77-03423

5D

Design and Control of Nitrifying Activated Sludge Systems,
W77-03426

5D

Keep Cool with Sewage Effluent - A Two-Way Saving of Water,
W77-03578

3E

NITROGEN

Determining the Most Profitable Nitrogen Fertilization for Corn Production,
W77-03172

3F

Effect of Added Salts on Nitrogen Released and Nitrate Levels in Forest Soils of the Washington Coastal Area,
W77-03396

2G

Origin of Nitrogen Pollution in Surface and Waste Waters (Origines Des Pollutions Azotes Dans Les Eaux Superficielles Et Les Eaux Usees),
W77-03423

5D

Nitrate Monitoring.
W77-03468

5A

Removal of BOD and Nitrogenous Pollutants from Wastewaters,
W77-03486

5D

Significance of Nitrates in Drinking Water, (In Russian),
W77-03541

5B

NITROGEN COMPOUNDS

Activated Sludge Waste Water Treatment Process - Using Succession of Aerobic and Anaerobic Zones to Remove Nitrogenous Material.
W77-03402

5D

NON-STRUCTURAL ALTERNATIVES

Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana.
W77-03182

4A

Flood Plain Information: Scioto and Olentangy Rivers, Ohio, Columbus Area, Summary Report.
W77-03183

4A

NONPOINT SOURCE POLLUTION

Temporal Variations in Tributary Phosphorus Loads,
W77-03123

5B

Delaware 1975 State Water Quality Inventory.
W77-03378

5G

SUBJECT INDEX

OFFSHORE PLATFORMS

NONSTRUCTURAL ALTERNATIVES

Corps' New Look in Flood Control: No Dams, Levees, W77-03393 4A

NORTH CAROLINA

Flow Dynamics of the Neuse River Estuary, W77-03300 2L

Rehabilitation of Pamlico Sound Oyster Producing Grounds Damaged or Destroyed by Hurricane Ginger, W77-03362 6B

NORTH DAKOTA

Plan of Study of the Hydrology of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming. W77-03338 4B

NORWAY

Pelagic Tar in the Norwegian Coastal Current, W77-03190 5B

Structure of the Glacier Charles Rabots Bre, Norway, W77-03311 2C

Water Quality, Plankton and Eutrophication of Bergsvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian), W77-03395 5C

NORWAY (UTSIRA AREA)

Litter and Oil on the Shores of Utsira, Rogaland County, During Autumn 1974, (In Danish), W77-03125 5B

NUCLEAR ACTIVATION ANALYSIS

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples, W77-03202 5A

NUCLEAR METERS

Calibration of Neutron Probe in Some Selected Hawaiian Soils, W77-03321 2G

NUCLEAR POWERPLANTS

Winter Conditions in the New York Bight, 1973-1974, W77-03380 5C

NUMERICAL ANALYSIS

Exact Solution of Gradually Varied Flow, W77-03085 8B

Numerical Studies of Alaskan Region, W77-03231 5B

A Review of Clustering Techniques with Emphasis on Benthic Ecology, W77-03372 5A

NUTRIENT REMOVAL

Eutrophication and Restoration of Lakes Receiving Nutrients from Diffuse Sources Only, W77-03536 5C

NUTRIENTS

Surf-Zone Water Quality in Liverpool Bay, W77-03092 5B

The Effects of Sewage Effluent on Wetland Ecosystems, W77-03354 5C

Breakup Flooding and Nutrient Source of Colville River Delta During 1973, W77-03388 5B

Effect of Added Salts on Nitrogen Released and Nitrate Levels in Forest Soils of the Washington Coastal Area, W77-03396 2G

Phytoplankton Response to Phosphorus and Silica Enrichments in Lake Michigan, W77-03537 5C

Water Quality, Plankton and Eutrophication of Bergsvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian), W77-03395 5C

OAK CREEK (NB)

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin. W77-03181 4A

OBSERVATION WELLS

Ground-Water Levels in New Mexico, 1975, W77-03330 7C

OCEAN CIRCULATION

Current Measurements in the Beaufort Sea, W77-03228 2L

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B

STD Mappings of the Beaufort Sea Shelf, W77-03233 2L

Outer Continental Shelf Energy Program, W77-03234 5B

Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program, W77-03237 5A

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska, W77-03238 5B

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L

OCEAN CURRENTS

Distribution and Source of Tar on the Pacific Ocean, W77-03191 5B

Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography, W77-03227 5B

Current Measurements in the Beaufort Sea, W77-03228 2L

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

STD Mappings of the Beaufort Sea Shelf, W77-03233 2L

Outer Continental Shelf Energy Program, W77-03234 5B

Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska, W77-03235 5B

Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L

OCEAN WAVES

High-Wave Conditions Observed Over the North Atlantic in September 1961, W77-03090 2L

OCEANOGRAPHIC DATA

Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C

OCEANOGRAPHY

Winter Conditions in the New York Bight, 1973-1974, W77-03380 5C

OCEANS

Unions Fight a Jones Act Waiver. W77-03532 6E

A Closer Look at Some Issues for General Oceans Policy, Marine Environment, and Fisheries, W77-03585 6E

ODOR

A Preliminary Study of the Taste and Odor Problems in Grand Lake, Ohio and the Wabash Rivers, Indiana, W77-03384 5C

OEDOGONIO-EPITHEMIETUM LITORALAE

The Primary Production of the Periphyton Association Oedogonio-Epithemietum Litoralae, W77-03374 5C

OENOTHERA-BIENNIS

Cultivation and Breeding of Oenothera-Plant: IV. Effect of Soil Moisture on Growth and Components in Seed of O. Biennis, (In Japanese), W77-03148 2I

OFFSHORE DRILLING

Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L

Yukon Delta Coastal Processes Study, W77-03255 2L

OFFSHORE PERMAFROST

Beaufort Seacoast Permafrost Studies, W77-03262 2C

OFFSHORE PLATFORMS

Yukon Delta Coastal Processes Study, W77-03255 2L

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L

Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03272 2C

SUBJECT INDEX

OFFSHORE PLATFORMS

Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03273 2C

Winter Conditions in the New York Bight, 1973-1974, W77-03380 5C

OFFSHORE STRUCTURES

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L

OHIO

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio, W77-03174 4A

Flood Plain Information: Scioto and Olentangy Rivers, Ohio, Columbus Area, Summary Report, W77-03183 4A

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D

Soil Potassium Relationships as Indicated by Solution Equilibria and Plant Uptake, W77-03395 2G

OIL

Macoma Balthica: An Indicator of Oil Pollution, W77-03185 5A

Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp, W77-03186 5C

Effects of Oil Pollution on Breeding Grey Seals, W77-03187 5C

Pelagic Tar in the Norwegian Coastal Current, W77-03190 5B

Distribution and Source of Tar on the Pacific Ocean, W77-03191 5B

Effects of Oil on Beaches in West Cork, Ireland, W77-03192 5C

Influence of Illumination on Phytotoxicity of Crude Oil, W77-03193 5C

Olympic Alliance Oil Spillage, W77-03195 5C

OIL DEVELOPMENT

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska, W77-03218 5C

Near-Shore Atmospheric Modification, W77-03242 5B

Yukon Delta Coastal Processes Study, W77-03255 2L

The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C

Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C

OIL EXPLORATION

Near-Shore Atmospheric Modification, W77-03242 5B

Yukon Delta Coastal Processes Study, W77-03255 2L

The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C

OIL INDUSTRY

Unions Fight a Jones Act Waiver, W77-03532 6E

OIL LUMPS

Effects of Oil on Beaches in West Cork, Ireland, W77-03192 5C

OIL POLLUTION

Litter and Oil on the Shores of Utsira, Rogaland County, During Autumn 1974, (In Danish), W77-03125 5B

Macoma Balthica: An Indicator of Oil Pollution, W77-03185 5A

Effects of Oil Pollution on Breeding Grey Seals, W77-03187 5C

Toxicity of Crude Oils and a Dispersant to the Stony Coral *Madraris Mirabilis*, W77-03196 5C

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory, W77-03197 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea, W77-03217 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska, W77-03218 5C

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf, W77-03224 5B

Microbial Release of Soluble Trace Metals from Oil Impacted Sediments, W77-03225 5C

Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea, W77-03226 5B

Current Measurements in the Beaufort Sea, W77-03228 2L

Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas, W77-03229 5C

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

Numerical Studies of Alaskan Region, W77-03231 5B

Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B

Outer Continental Shelf Energy Program, W77-03234 5B

Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program, W77-03237 5A

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska, W77-03238 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas, W77-03239 5B

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

Near-Shore Atmospheric Modification, W77-03242 5B

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L

Yukon Delta Coastal Processes Study, W77-03255 2L

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L

Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska, W77-03258 2L

Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

Beaufort Seacoast Permafrost Studies, W77-03262 2C

Benthos-Sedimentary Substrate Interactions, W77-03263 5C

Faulting and Instability of Shelf Sediments - Western Gulf of Alaska, W77-03264 2L

The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C

Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies, W77-03277 7B

SUBJECT INDEX

ORGANIC CARBON

OIL POLLUTION EFFECTS

Macoma Balthica: An Indicator of Oil Pollution,
W77-03185 5A

OIL SHALES

Hydrologic Studies by the U.S. Geological Survey in Oil-Shale Areas of Colorado, Utah, and Wyoming, 1976.
W77-03340 4B

OIL SPILL

Physical Oceanography of the Gulf of Alaska,
W77-03241 5B

OIL SPILLS

Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp,
W77-03186 5C

Pelagic Tar in the Norwegian Coastal Current,
W77-03190 5B

Effects of Oil on Beaches in West Cork, Ireland,
W77-03192 5C

Influence of Illumination on Phytotoxicity of Crude Oil,
W77-03193 5C

The Effect of Oil Pollution in Bantry Bay,
W77-03194 5C

Olympic Alliance Oil Spillage,
W77-03195 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea,
W77-03217 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska,
W77-03218 5C

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf,
W77-03221 5B

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria,
W77-03223 5C

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf,
W77-03224 5B

Microbial Release of Soluble Trace Metals from Oil Impacted Sediments,
W77-03225 5C

Current Measurements in the Beaufort Sea,
W77-03228 2L

Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas,
W77-03229 5C

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop),
W77-03230 6G

Numerical Studies of Alaskan Region,
W77-03231 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas,
W77-03239 5B

Yukon Delta Coastal Processes Study,
W77-03255 2L

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin,
W77-03256 2L

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska,
W77-03257 2L

The Interaction of Oil with Sea Ice in the Arctic Ocean,
W77-03267 5C

Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies,
W77-03277 7B

OIL WASTES

Pelagic Tar in the Norwegian Coastal Current,
W77-03190 5B

The Effect of Oil Pollution in Bantry Bay,
W77-03194 5C

Olympic Alliance Oil Spillage,
W77-03195 5C

Toxicity of Crude Oils and a Dispersant to the Stony Coral *Madracis Mirabilis*,
W77-03196 5C

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory,
W77-03197 5C

OIL WATERS

Olympic Alliance Oil Spillage,
W77-03195 5C

OILED SEALS

Effects of Oil Pollution on Breeding Grey Seals,
W77-03187 5C

OILSEED CROPS

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower,
W77-03135 3F

OILY WATER

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory,
W77-03197 5C

OKLAHOMA

Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification,
W77-03208 2H

Talley V Carley (Priorities to Water in 1963 Amendment to 82 Oklahoma Statutes Annotated Section I-A).
W77-03521 6E

OLEIC ACID

Biochemical Mechanisms in the Methane Fermentation of Glutamic and Oleic Acids,
W77-03441 5D

OLENTANGY RIVER (OH)

Flood Plain Information: Scioto and Olentangy Rivers, Ohio, Columbus Area, Summary Report.
W77-03183 4A

OLFACTORY RESPONSE

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*,
W77-03184 5C

OLFACTORY SENSITIVITY

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*,
W77-03184 5C

OLSZEWSKI TUBES

Eutrophication and Restoration of Lakes Receiving Nutrients from Diffuse Sources Only,
W77-03536 5C

ON-SITE INVESTIGATIONS

Allatoona Lake, Destratification Equipment Test Report.
W77-03306 5G

Seasonal Variation of Residual Drift in Long Island Sound,
W77-03322 2L

ONTARIO

Monitoring of Community Water Supplies,
W77-03463 5A

OPEN CHANNEL FLOW

Minimum Unit Stream Power and Fluvial Hydraulics,
W77-03080 8B

Flow and Bed Topography in Curved Open Channels,
W77-03084 8B

Experimental Investigation of Flow Over Side Weirs,
W77-03317 8B

OPEN CHANNELS

The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England,
W77-03314 4C

OPTICAL PROPERTIES

Measurement of 'Turbidity' and Related Characteristics of Natural Waters,
W77-03339 7B

OPTIMIZATION

OPTRM - A Hydrologic Transport Model With Parameter Optimization,
W77-03115 5B

Application of a Model for Layout and Design of Sewer Systems,
W77-03133 5B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume III - Operational Design, Final Report.
W77-03215 3B

Technical Assistance Project Greeley Wastewater Treatment Facility, Greeley, Colorado, June-July, 1972,
W77-03368 5D

ORGANIC CARBON

Ecology of Aquatic Saprophytic Phycocyanes. II, (In Russian),
W77-03201 5C

SUBJECT INDEX

ORGANIC COMPOUNDS

ORGANIC COMPOUNDS

Hygienic Substantiation of the Maximum Permissible Concentration of Tin Tributylmethacrylate in Water Bodies, (In Russian), W77-03107 5A

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf, W77-03224 5B

Investigations on the Importance of the Organic Chloro-Compounds and their Adsorbability (Untersuchungen Zur Bedeutung der Organischen Chlorverbindungen und Ihrer Adsorbierbarkeit), W77-03465 5A

Hygienic Standardization of the Content in Water of Monoisobutylamine and Diisobutylamine During their Combined Action, (In Russian), W77-03481 5B

Experimental Substantiation of the Maximal Permissible Concentrations of Triethanolamine, Ammonium and Calcium Salts of Alkylbenzosulfates in Water Bodies, (In Russian), W77-03586 5B

ORGANIC LOADING

A Study of Substrate Removal in a Microbial Film Reactor, W77-03480 5D

ORGANIC MATTER

Investigations on the Role of Dissolved Organic Matter in Determining Ecosystem Structure and Function: The Plankton and Photoheterotrophy, W77-03389 5C

ORGANIC PHOSPHORUS

Organic Phosphorus in Lakes, W77-03210 5C

OUTER BANKS (NC)

Nature and Genesis of Some Storm Washover Deposits, W77-03293 2L

OUTER CONTINENTAL SHELF

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea, W77-03217 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska, W77-03218 5C

Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons, W77-03219 5A

Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B

Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas, W77-03222 5B

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf, W77-03224 5B

Microbial Release of Soluble Trace Metals from Oil Impacted Sediments, W77-03225 5C

Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea, W77-03226 5B

Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography, W77-03227 5B

Current Measurements in the Beaufort Sea, W77-03228 2L

Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas, W77-03229 5C

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

Numerical Studies of Alaskan Region, W77-03231 5B

Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B

STD Mappings of the Beaufort Sea Shelf, W77-03233 2L

Outer Continental Shelf Energy Program, W77-03234 5B

Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska, W77-03235 5B

Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program, W77-03237 5A

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska, W77-03238 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas, W77-03239 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases, W77-03240 5B

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

Near-Shore Atmospheric Modification, W77-03242 5B

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B

Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska, W77-03245 2L

The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain, W77-03246 2L

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf, W77-03248 2L

Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L

Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L

Distribution and Character of Icings in Northeastern Alaska, W77-03252 2C

A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs, W77-03253 5B

Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L

Yukon Delta Coastal Processes Study, W77-03255 2L

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L

Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska, W77-03258 2L

Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska, W77-03259 2L

Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

Beaufort Seacoast Permafrost Studies, W77-03262 2C

Benthos-Sedimentary Substrate Interactions, W77-03263 5C

SUBJECT INDEX

PATH OF POLLUTANTS

Faulting and Instability of Shelf Sediments -
Western Gulf of Alaska,
W77-03264 2L

A Historical Summary of Earthquake Epicen-
ters in and Near Alaska,
W77-03265 7C

A Study of Beaufort Sea Coastal Erosion -
Northern Alaska,
W77-03266 2L

The Interaction of Oil with Sea Ice in the Arc-
tic Ocean,
W77-03267 5C

Dynamics of Near-Shore Ice,
W77-03268 2C

Dynamics of Near-Shore Ice (Data Buoys),
W77-03269 2C

Study of Climatic Effects on Fast Ice Extent
and its Seasonal Decay Along the Beaufort Sea
Coast,
W77-03270 2C

Mechanics of Origin of Pressure Ridges, Shear
Ridges and Hummock Fields in Landfast Ice,
W77-03271 2L

Morphology of Bering Near Shore Ice Condi-
tions by Means of Satellite and Aerial Remote
Sensing,
W77-03272 2C

Morphology of Beaufort Near Shore Ice Condi-
tions by Means of Satellite and Aerial Remote
Sensing,
W77-03273 2C

Experimental Measurements of Sea Ice Failure
Stresses Near Grounded Structures,
W77-03274 2C

Beaufort Sea, Chukchi Sea, Bering Strait
Historical Baseline Ice Study,
W77-03275 2C

Development of Hardware and Procedures for
In-Situ Measurement of Creep in Sea Ice,
W77-03276 2C

Operation of an Alaskan Facility for Applica-
tions of Remote-Sensing Data to OCS Studies,
W77-03277 7B

Large Sand Waves on the Atlantic Outer Con-
tinental Shelf Around Wilmington Canyon, Off
Eastern United States,
W77-03332 2L

OXIDATION

An Evaluation of Aqueous Phase Catalytic Ox-
idation,
W77-03079 5D

Decontamination of Water Contaminated with
Polycyclic Aromatic Hydrocarbons (PAH). I.
Action of Chlorine and Ozone on PAH Dis-
solved in Doubly Distilled and in De-Ionized
Water,
W77-03369 5D

The Influence of Carbon-Nitrogen Ratio on the
Chlorination of Microbial Aggregates,
W77-03414 5D

OXIDATION LAGOONS

Suitability of Lagoon Effluents for Irrigation in
South Dakota,
W77-03152 5D

A Study on the Application of Biogrowth
Sheets to Improve Lagoon Effluent Quality,
W77-03162 5D

Toxicity of Ammonia to Algae in Sewage Ox-
idation Ponds,
W77-03413 5D

OXYGEN

Comparison of Air and Oxygen Activated
Sludge Systems,
W77-03443 5D

Oxygen and Air Activated Sludge: Another
View,
W77-03444 5D

Effect of High Dissolved Oxygen Concentra-
tion in Activated Sludge Systems,
W77-03571 5D

Oxygen Transfer in a 23-Meter Bubble Column,
W77-03579 5D

OXYGEN DEMAND

Effect of Variable Loading on Oxygen Uptake,
W77-03473 5D

OXYGEN TRANSFER

Investigation of Oxygen Transfer to Slime as a
Surface Reaction,
W77-03476 5B

Aeration and Oxygen Transfer in Biological
Reactors,
W77-03575 5D

OXYGEN UPTAKE

The Electrolytic Respirometer - I. Factors Af-
fecting Oxygen Uptake Measurements,
W77-03457 5A

Effect of Variable Loading on Oxygen Uptake,
W77-03473 5D

OXYGENATION

An Economic Evaluation of Deep Tank Aera-
tion for Wastewater Treatment,
W77-03580 5D

OYSTERS

Rehabilitation of Pamlico Sound Oyster
Producing Grounds Damaged or Destroyed by
Hurricane Ginger,
W77-03562 6B

OZONATION

Comparative Assessment of the Effectiveness
of Certain Methods Making Industrial Effluents
Noncarcinogenic, (In Russian),
W77-03488 5D

OZONE

Decontamination of Water Contaminated with
Polycyclic Aromatic Hydrocarbons (PAH). I.
Action of Chlorine and Ozone on PAH Dis-
solved in Doubly Distilled and in De-Ionized
Water,
W77-03369 5D

PACIFIC NORTHWEST (US)

Electric Power Development in the Pacific
Northwest Region: Institutional Commitments
and Alternatives, Phase I,
W77-03288 6E

PACIFIC OCEAN

Distribution and Source of Tar on the Pacific
Ocean,
W77-03191 5B

PACKAGE PLANTS

Effect of Variable Loading on Oxygen Uptake,
W77-03473 5D

PAINTS

Paint Formulating Point Source Category Ef-
fluent Guidelines and Standards.
W77-03526 5G

PAMLICO SOUND (NC)

Flow Dynamics of the Neuse River Estuary,
W77-03300 2L

Rehabilitation of Pamlico Sound Oyster
Producing Grounds Damaged or Destroyed by
Hurricane Ginger,
W77-03562 6B

PATENTS

Activated Sludge Waste Water Treatment
Process - Using Succession of Aerobic and
Anaerobic Zones to Remove Nitrogenous
Material.
W77-03402 5D

Screening Apparatus for Removal of Solids -
From Sewage with Rotating Screen and Verti-
cal Lift for Residues.
W77-03403 5D

Biological Treatment of Sewage Waters -
Device with Internal Aeration Zone,
W77-03404 5D

Sludge Collector and Light Liquid Separator-
From Sewage with Two Tanks in Single Hous-
ing and Cover.
W77-03405 5D

Sewerage Treatment Apparatus,
W77-03406 5D

Biological Purification of Sewage Water-In a
Multi-Stage Treatment Tank With Rotating
Contactor Surfaces Partly Immersed in the
Liquid.
W77-03407 5D

Coagulation Clarifying Effluents Contaminated
with Colloid Suspensions-By Electrophoresis
After Mixing in Insoluble Metallic Particles.
W77-03408 5D

Biological Converter for Faecal Matter in
Water - Using Rotary Tubes With Fibrous
Filling Supporting the Bacterial Culture.
W77-03409 5D

Centrifuge for Dewatering Sewage Sludge.
W77-03410 5D

Integral Circular Wastewater Treatment Plant.
W77-03411 5D

Removal of BOD and Nitrogenous Pollutants
from Wastewaters,
W77-03486 5D

Sewage Sludge Treatment System,
W77-03487 5D

Fluidized Waste Incinerator and Method,
W77-03489 5D

PATH OF POLLUTANTS

Coastal Region Residence Time Estimates from
Concentration Gradients,
W77-03093 5C

OPTRM - A Hydrologic Transport Model With
Parameter Optimization,
W77-03115 5B

The Transport of Pollutants in Ground Water,
(In German),
W77-03131 5B

SUBJECT INDEX

PATH OF POLLUTANTS

Pelagic Tar in the Norwegian Coastal Current, W77-03190 5B

Distribution and Source of Tar on the Pacific Ocean, W77-03191 5B

Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas, W77-03222 5B

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska, W77-03238 5B

Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L

Simulation of Pesticide Movement on Small Agricultural Watersheds, W77-03540 5B

PATHOGENIC BACTERIA

Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water, W77-03474 5A

PATUXENT RIVER (MD)

Seasonal Interactions Among Estuarine Primary Producers and Herbivores, W77-03387 2L

PEAK DISCHARGE

Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire, W77-03177 4A

PEANUTS

Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D

PELAGIC TAR

Pelagic Tar in the Norwegian Coastal Current, W77-03190 5B

PELAGIC ZOOPLANKTON

Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin, W77-03077 5C

PENNSYLVANIA

The Unit Hydrograph: A Satisfactory Model of Watershed Response, W77-03126 4D

Seasonal Demarcation in Pennsylvania for Hydrological Use, W77-03127 2B

Commonwealth V. Barnes and Tucker Company (Public Nuisance of Acid Mine Drainage), W77-03519 6E

PERIPHYTON

Pelagic Tar in the Norwegian Coastal Current, W77-03190 5B

The Primary Production of the Periphyton Association Oedogonio-Epithemietum Litoralae, W77-03374 5C

PERMAFROST

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L

Distribution and Character of Icings in Northeastern Alaska, W77-03252 2C

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

Beaufort Seacoast Permafrost Studies, W77-03262 2C

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

PERMEABILITY

Permeability and Ground Water Circulation in the Madison Aquifer Along the Eastern Flank of the Bighorn Mountains of Wyoming, W77-03122 2F

PERMITS

Colorado Water Quality Control Act, W77-03490 6E

Floating Timber on Streams, W77-03492 6E

Carlson V Village of Worth (Preemption of Local Regulation of Sanitary Landfill by Environmental Protection Act), W77-03497 6E

Virginia State Program for Control of Discharge of Pollutants to Navigable Waters; Approval, W77-03527 5G

The Wyoming Water Quality Act and the Federal Water Pollution Control Act Amendments of 1972: A Comparison, W77-03600 5G

PERTURBATION METHOD

A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03151 4A

PESTICIDE KINETICS

Simulation of Pesticide Movement on Small Agricultural Watersheds, W77-03540 5B

PESTICIDES

Proposed Toxic Pollutant Effluent Standards, W77-03529 5G

The Impact of Intensive Application of Pesticides and Fertilizers on Underground Water Recharge Areas which May Contribute to Drinking Water Problems, W77-03567 5B

PETROLEUM RESOURCES

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea, W77-03217 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska, W77-03218 5C

Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas, W77-03222 5B

Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea, W77-03226 5B

Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography, W77-03227 5B

Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas, W77-03229 5C

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

Numerical Studies of Alaskan Region, W77-03231 5B

Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B

STD Mappings of the Beaufort Sea Shelf, W77-03233 2L

Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program, W77-03237 5A

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska, W77-03238 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas, W77-03239 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases, W77-03240 5B

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

Near-Shore Atmospheric Modification, W77-03242 5B

Benthos-Sedimentary Substrate Interactions, W77-03263 5C

The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C

Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C

PHASIC DEVELOPMENT (ALFALFA)

Effect of Water Stress on the Phasic Development of Annual Medicago Species, W77-03136 2I

PHENOLS

An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D

The Kinetics of Adsorption of Phenols by Granular Activated Carbon, W77-03149 5D

SUBJECT INDEX

PLANTING MANAGEMENT

Model Studies in Aqueous Chlorination: The Chlorination of Phenols in Dilute Aqueous Solutions, W77-03458 5A

PHENOXYETHANOL

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*), W77-03204 5C

PHOSPHATES

Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in *Anodonta Cygnea*, (In Russian), W77-03366 5C

Specific Role of Lime in Municipal Waste Water Treatment-Expectations and Reality (Die Spezifische Rolle Des Kalks in Der Kommunalen Abwasserreinigung-Erwartungen Und Realitaeten), W77-03422 5D

Those Nasty Phosphatic Clay Ponds, W77-03596 5G

PHOSPHOROUS COMPOUNDS

Those Nasty Phosphatic Clay Ponds, W77-03596 5G

PHOSPHORUS

Treatment of Livestock Wastes by a Barrired Landscape Water Renovation System, W77-03116 5D

Temporal Variations in Tributary Phosphorus Loads, W77-03123 5B

The Phosphorus Pollution of Waters Due to Agriculture, (In German), W77-03134 5B

Organic Phosphorus in Lakes, W77-03210 5C

Experimental Studies on Material Transactions Between Mud and Water of the Gnadensee, W77-03370 5C

Lake Phosphorus Loading Graphs: An Alternative, W77-03377 5C

The Hard Job of Saving Lake Erie, W77-03534 5G

PHOSPHORUS LOADING GRAPHS

Lake Phosphorus Loading Graphs: An Alternative, W77-03377 5C

PHOTOHETEROTROPHY

Investigations on the Role of Dissolved Organic Matter in Determining Ecosystem Structure and Function: The Plankton and Photoheterotrophy, W77-03389 5C

PHOTOLYSIS

Photolysis of 5-Chlorouracil in Natural Waters, W77-03477 5B

PHOTOSYNTHESIS

A Comparison of Seasonal Primary Production of Mojave Desert Shrubs During Wet and Dry Years, W77-03138 2I

Comparative Photosynthetic Production of Mojave Desert Shrubs, W77-03141 2D

Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions, W77-03142 2D

The Primary Production of Lake Sibaya, Kwazulu, South Africa, W77-03376 5C

PHYSICAL OCEANOGRAPHY

Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography, W77-03227 5B

Gulf of Alaska Study of Mesoscale Oceanographic Processes 'Gas-Mop', W77-03230 6G

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

PHYSICAL PROPERTIES

Data on Selected Lakes in Washington, Part 5, W77-03350 7C

PHYSICOCHEMICAL PROPERTIES

Physicochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification, W77-03208 2H

PHYTOPLANKTON

Plankton of Coastal Lagoons: XI. Transport in Three Estuaries of the Northwest of Mexico (November, 1973) (In Spanish), W77-03145 2L

Phytoplankton Ecology in Valparaiso Bay: III. Phytoplankton from 1972-73, (In Spanish), W77-03200 5C

Investigations on the Role of Dissolved Organic Matter in Determining Ecosystem Structure and Function: The Plankton and Photoheterotrophy, W77-03389 5C

Phytoplankton Response to Phosphorus and Silica Enrichments in Lake Michigan, W77-03537 5C

PHYTOTOXICITY

Influence of Illumination on Phytotoxicity of Crude Oil, W77-03193 5C

Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois, W77-03565 5A

PIER SCOUR

Scour Around Bridge Piers, W77-03294 8B

PIERS

Scour Around Bridge Piers, W77-03294 8B

Providence and Worcester Company V. Exxon Corporation (Right-of-Way in Land Submerged in Tidewater), W77-03496 6E

PILOT PLANTS

One Pass Seawater Desalting RO Pilot Plant Evaluation, W77-03076 3A

Sludge Dewatering Pilot Plant Design, Part I, W77-03416 5D

High Gradient Magnetic Filtration, W77-03418 5D

Effect of Variable Loading on Oxygen Uptake, W77-03473 5D

PINEY POINT AQUIFER (DEL)

Hydraulic Characteristics of the Piney Point Aquifer and Overlying Confining Bed Near Dover, Delaware, W77-03331 2F

PIPELINES

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L

Ductile Iron Pipe Solves a Tough Sewer Problem at Jimerson Creek, W77-03398 8G

PIPING (EROSION)

Piping in Earth Dams Constructed of Dispersive Clay; Literature Review and Design of Laboratory Tests, W77-03112 8D

PLANKTON

Pelagic Tar in the Norwegian Coastal Current, W77-03190 5B

Water Quality, Plankton and Eutrophication of Bergsvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian), W77-03595 5C

PLANNING

Local Water Systems are Frequently Neglected, W77-03121 6B

Use of Hybrid Computer Model in Resource Planning, W77-03523 6A

Iowa's Water Resources Program Progress and Needs, W77-03547 6B

Iowa Water Resources Framework Study Plan of Study, W77-03561 6B

PLANT GROWTH

A Comparison of Seasonal Primary Production of Mojave Desert Shrubs During Wet and Dry Years, W77-03138 2I

Comparative Photosynthetic Production of Mojave Desert Shrubs, W77-03141 2D

Cultivation and Breeding of *Oenothera*-Plant: IV. Effect of Soil Moisture on Growth and Components in Seed of *O. Biennis*, (In Japanese), W77-03148 2I

Reactions of Heavy Metals With Soils With Special Regard to Their Application in Sewage Wastes, W77-03359 5B

PLANT POPULATIONS

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

PLANTING MANAGEMENT

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower, W77-03135 3F

SUBJECT INDEX

PLASTIC PIPES

PLASTIC PIPES

Innovations in Sewer Design and Construction,
W77-03399 8G

PLASTICS

Plastic-Reinforced Asphalt Seepage Barrier,
W77-03120 3B

POINT SOURCES (POLLUTION)

Implementing the National Water Pollution
Control Permit Program: Progress and
Problems.
W77-03588 5G

POISONS

Poisoning of, and Obstruction to, Fish.
W77-03500 6E

POLAND

The Primary Production of the Periphyton As-
sociation Oedogonio-Epithemietum Litorale,
W77-03374 5C

POLIOVIRUS (INACTIVATION)

Heat Inactivation of Poliovirus in Waste Water
Sludge.
W77-03448 5C

POLITICAL ASPECTS

Hurdles in the Path of Coastal Plan Implemen-
tation,
W77-03582 6B

POLLUTANT IDENTIFICATION

Hygienic Substantiation of the Maximum Per-
missible Concentration of Tin Tributyl-
methacrylate in Water Bodies, (In Russian),
W77-03107 5A

Determination of Arsenic in Drinking Water by
Means of Silver Diethyldithiocarbamate, (In
Russian),
W77-03113 5A

Molecular Activation Analysis and Its Applica-
tion to Methylmercury Determination in Vari-
ous Marine Samples,
W77-03202 5A

A Study of the Suspended Particulate Problem
in the Duwamish Basin,
W77-03291 5A

Bear River Evaluation Report, 1974 Survey,
W77-03292 5B

Preliminary Assessment of Suspected Car-
cinogens in Drinking Water: Report to Con-
gress.
W77-03360 5A

Water Usage and Wastewater Characterization
at a Crops of Engineers Recreation Area,
W77-03362 5A

Correlation Between BOD - TOC - TOD
(Zusammenhang Zwischen BSE5 - TOC -
TOD),
W77-03436 5D

Virus and Bacterial Removal from Waste
Water by Land Treatment,
W77-03447 5D

Heat Inactivation of Poliovirus in Waste Water
Sludge,
W77-03448 5C

An Operator's Approach to Aerobic Digester
Supernatant Disposal Problems,
W77-03449 5D

Intermittent Sand Filtration of Household
Wastewater,
W77-03452 5D

The Electrolytic Respirometer - I. Factors Af-
fecting Oxygen Uptake Measurements,
W77-03457 5A

Monitoring of Community Water Supplies,
W77-03463 5A

Investigations on the Importance of the Or-
ganic Chloro-Compounds and their Adsorba-
bility (Untersuchungen Zur Bedeutung der Or-
ganischen Chlorverbindungen und Ihrer Adsor-
bierbarkeit),
W77-03465 5A

A New Method of Automatic Determination of
Nitrate in Waste Waters and Polluted Surface
Waters (Ein Neues Verfahren Zur Auto-
matischen Nitrat-Bestimmung in Abwassern
und Belasteten Oberflaechenwaessern),
W77-03466 5A

Ultraviolet Purification System.
W77-03467 5A

Nitrate Monitoring.
W77-03468 5A

Microbiological Examination of Waters and Ef-
fluents,
W77-03470 5A

The Aerial Photo-Water Quality Link.
W77-03471 5A

The Limitation of the Ratio of Fecal Coliforms
to Total Coliphage as a Water Pollution Index,
W77-03472 5A

Rapid Detection of Bacterial Endotoxins in
Drinking Water and Renovated Waste Water,
W77-03474 5A

Photolysis of 5-Chlorouracil in Natural Waters,
W77-03477 5B

Transferable Drug Resistance Associated with
Coliforms Isolated from Hospital and Domestic
Sewage,
W77-03478 5A

Aerosol Production by Irrigation Equipment
Used for Land Application of Waste Water,
W77-03484 5A

Risk of Communicable Disease Infection As-
sociated with Waste Water Irrigation in
Agricultural Settlements,
W77-03485 5C

POLLUTANT TRANSPORT

Transport of Pollutants in the Vicinity of Prud-
hoe Bay, Alaska,
W77-03238 5B

POLLUTANTS

Assessment of Potential Interactions of
Microorganisms and Pollutants Resulting from
Petroleum Development on the Outer Con-
tinental Shelf in the Beaufort Sea,
W77-03217 5C

Transport of Pollutants in the Vicinity of Prud-
hoe Bay, Alaska,
W77-03238 5B

Distribution, Composition and Transport of
Suspended Particulate Matter in the Gulf of
Alaska and Southeastern Bering Shelf,
W77-03248 2L

POLLUTION

Relation Between Atmospheric Pollution,
Precipitation, and Streamwater Quality Near A
Large Urban-Industrial Complex,
W77-03097 5B

POLLUTION ABATEMENT

Origin of Nitrogen Pollution in Surface and
Waste Waters (Origines Des Pollutions Azotees
Dans Les Eaux Superficielles Et Les Eaux
Usees),
W77-03423 5D

Water Pollution.

W77-03495 6E

POLYCYCLIC AROMATIC HYDROCARBONS

Decontamination of Water Contaminated with
Polycyclic Aromatic Hydrocarbons (PAH). I.
Action of Chlorine and Ozone on PAH Dis-
solved in Doubly Distilled and in De-Ionized
Water,
W77-03369 5D

POLYELECTROLYTES

Recent Developments in the Use of Polyelec-
trolytes,
W77-03569 5D

PORE WATER

A Model for the Control of Dissolved Man-
ganese in the Interstitial Waters of Chesapeake
Bay,
W77-03556 5B

POROSITY

Measurement of Nonexchanging Pores During
Miscible Displacement in Soils,
W77-03320 2G

POROUS MEDIA

Piping in Earth Dams Constructed of Disper-
sive Clay; Literature Review and Design of
Laboratory Tests,
W77-03112 8D

PORTER ARROYO (NM)

Flood Plain Information: San Juan River and
Tributaries, Farmington, New Mexico.
W77-03176 4A

POTABLE WATER

Determination of Arsenic in Drinking Water by
Means of Silver Diethyldithiocarbamate, (In
Russian),
W77-03113 5A

Research Needs for the Potable Reuse of Mu-
nicipal Wastewater,
W77-03356 5D

National Safe Drinking Water Strategy, One
Step at a Time.
W77-03357 5G

Preliminary Assessment of Suspected Car-
cinogens in Drinking Water: Report to Con-
gress.
W77-03360 5A

A Preliminary Study of the Taste and Odor
Problems in Grand Lake, Ohio and the Wabash
Rivers, Indiana,
W77-03384 5C

Rapid Detection of Bacterial Endotoxins in
Drinking Water and Renovated Waste Water,
W77-03474 5A

Significance of Nitrates in Drinking Water, (In
Russian),
W77-03541 5B

SUBJECT INDEX

PUMPING

POTASSIUM

Effects of Potassium on Adult Asiatic Clams, *Corbicula Manilensis*, W77-03119 5C

Soil Potassium Relationships as Indicated by Solution Equilibrations and Plant Uptake, W77-03395 2G

POTENTIAL EVAPOTRANSPIRATION

Computation of the Potential Evapotranspiration and Their Comparison with Values of the Actual Evapotranspiration of Lysimeters, (In German), W77-03118 2D

POTENTIAL FLOW

Hydrodynamic Forces on Multiple Circular Cylinders, W77-03081 8B

POTENTIOMETRIC LEVEL

Measured and Simulated Ground-Water Levels in the Franklin Area, Southeastern Virginia, W77-03326 7C

POWER PLANTS

Keep Cool with Sewage Effluent - A Two-Way Saving of Water, W77-03578 3E

PRECIPITATION (ATMOSPHERIC)

Rainfall in the Seychelles 1941 to 1970, W77-03096 2B

Relation Between Atmospheric Pollution, Precipitation, and Streamwater Quality Near A Large Urban-Industrial Complex, W77-03097 5B

Precipitation Chemistry Studies at Lake George: Acid Rains, W77-03098 5A

The Unit Hydrograph: A Satisfactory Model of Watershed Response, W77-03126 4D

Artificial Modification of Atmospheric Processes, W77-03303 3B

Precipitation on the Aral Sea Surface, (In Russian), W77-03592 2B

PREDATION

Response of *Daphnia* Population Size and Age Structure to Predation, W77-03390 2H

PRESQUE ISLE (PA)

Nature and Genesis of Some Storm Washover Deposits, W77-03293 2L

PRESSURE RIDGES

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice, W77-03271 2L

PRESUMPTIONS (LEGAL)

State Dept of Pollution Control V International Paper Co. (Determination of Fish Value That were Killed by Pollutants), W77-03498 6E

PRIBILOF SOUND

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L

PRIBILOF ISLANDS

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

PRIMARY PRODUCTIVITY

A Comparison of Seasonal Primary Production of Mojave Desert Shrubs During Wet and Dry Years, W77-03138 2I

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program, W77-03237 5A

The Primary Production of the Periphyton Association *Oedogonio-Epithemietum Litorale*, W77-03374 5C

The Primary Production of Lake Sibaya, Kwazulu, South Africa, W77-03376 5C

Phytoplankton Response to Phosphorus and Silica Enrichments in Lake Michigan, W77-03537 5C

PRIOR APPROPRIATION

Rights to Water, W77-03494 6E

PRIORITIES

Talley V Carley (Priorities to Water in 1963 Amendment to 82 Oklahoma Statutes Annotated Section 1-A), W77-03521 6E

PROBABILITY THEORY

Wet and Dry Periods of Annual Flow Series, W77-03319 2E

PROCESS DESIGN

An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D

PRODUCTIVITY

Growth, Mortality and Production of *Brachysynodontis Batensoda* (Pisces, Mochocidae) in the Southeastern Archipelago of Lake Tchad, (In French), W77-03597 2H

PROJECT POST-EVALUATION

The Muddy Road to Clean Water, W77-03587 5G

PROJECTIONS

Projections of Population, Employment, Income and Water Use for Iowa River Basins, 1975-2020, W77-03542 6D

PROJECTS

Annual Report, 1975-1976, (Hawaii Water Resources Research Center), W77-03165 9D

PROTECTION

Public Inland Lake Protection and Rehabilitation, W77-03510 6E

PROTOTYPE TESTS

Cavitation From Surface Irregularities in High Velocity, W77-03082 8B

PRUDHOE BAY

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

PSYCHOLOGICAL ASPECTS

Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens, W77-03590 6G

PSYCHROPHILIC BACTERIA

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

PUBLIC ACCESS

Clippinger V Birge (Riparian Rights in an Artificial Lake), W77-03512 6E

PUBLIC BEACH ACCESS

Freedom of Beach, W77-03584 6E

PUBLIC HEALTH

National Safe Drinking Water Strategy, One Step at a Time, W77-03357 5G

Preliminary Assessment of Suspected Carcinogens in Drinking Water: Report to Congress, W77-03360 5A

Report on Pollution in Las Vegas Wash and Las Vegas Bay, W77-03371 5C

Water, Lighting and Sewers, W77-03506 6E

PUBLIC INLAND LAKES

Public Inland Lake Protection and Rehabilitation, W77-03510 6E

PUBLIC PARTICIPATION

The Legal Framework for Public Participation in Canadian Water Management, W77-03543 6E

PUBLIC RIGHTS

Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I, W77-03288 6E

The Legal Framework for Public Participation in Canadian Water Management, W77-03543 6E

PUBLICATIONS

Publications List of the Idaho Water Resources Research Institute, W77-03154 10C

PULP AND PAPER INDUSTRY

Pollution of Interstate Waters of the Lower Columbia River Bonneville Dam to Cathlamet, Washington, W77-03385 5B

PUMPING

Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification, W77-03208 2H

SUBJECT INDEX

PUMPING

Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico--1975, W77-03327 7C

PUMPKINSEED (FISH)

Distribution and Feeding of Pumpkinseed (*Lepomis gibbosus*) and Black Crappie (*Pomoxis nigromaculatus*) in a power plant cooling lake, W77-03078 5C

PUMPS

Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification, W77-03208 2H

Large Factory-Built Pump Station Begins Operation, W77-03438 8C

PUNCTURE RESISTANCE

Plastic-Reinforced Asphalt Seepage Barrier, W77-03120 3B

PYROLYSIS

Combined Process of Pyrolysis and Combustion for Sludge Disposal, W77-03415 5D

Sewage Sludge Treatment System, W77-03487 5D

QUALITY CONTROL

Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons, W77-03219 5A

RADAR

Guidelines for Flash Flood and Small Tributary Flood Prediction, W77-03114 4A

Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography, W77-03227 5B

RAINBOW TROUT

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*, W77-03184 5C

Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*), W77-03203 5C

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*), W77-03204 5C

Response of *Daphnia* Population Size and Age Structure to Predation, W77-03390 2H

RAINFALL

Rainfall in the Seychelles 1941 to 1970, W77-03096 2B

Guidelines for Flash Flood and Small Tributary Flood Prediction, W77-03114 4A

RAINWATER

The Composition of Rainwater at Two Sites Near Townsville, Qld. (Australia), W77-03279 2K

REAL PROPERTY

Water Rights and Liens, W77-03499 6E

RECESSION CURVES

Normal-Mode Analysis of the Structure of Baseflow Recession Curves, W77-03313 2F

RECLAIMED WATER

Research Needs for the Potable Reuse of Municipal Wastewater, W77-03356 5D

Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water, W77-03474 5A

RECLAMATION

Residual Waste Management Research and Planning Projects, September 1975, W77-03355 5B

Research Needs for the Potable Reuse of Municipal Wastewater, W77-03356 5D

RECLAMATION STATES

Water for Nevada. Water Planning Report, W77-03545 6B

RECREATION

Multiple Use in the Southern Coastal Plains in the United States, W77-03173 4C

RECREATION FACILITIES

Water Usage and Wastewater Characterization at a Crops of Engineers Recreation Area, W77-03362 5A

RECREATIONAL WATERS

The Relationship of Bottom Sediments to Bacterial Water Quality in a Recreational Swimming Area, W77-03167 5B

RECYCLING

Land Based Sewage Sludge Management Alternatives for Los Angeles: Evaluation and Comparison, W77-03289 5D

Sewage Sludge Treatment System, W77-03487 5D

fermentation of Waste Materials to Produce Industrial Intermediates, W77-03563 5D

REFORESTATION

Afforestation in Low Rainfall Areas, W77-03139 4D

REGIONAL ANALYSIS

User Oriented Systems Analysis for Regional Municipal Water Supply Planning, W77-03159 6A

REGRESSION ANALYSIS

Depth and Frequency of Floods in Illinois, W77-03346 2E

REGULATION

Individual Sewage Disposal System Act, W77-03491 6E

Secondary Treatment Information; Biochemical Oxygen Demand, Suspended Solids and pH, W77-03530 5G

The Cost of Coastal Zoning, W77-03535 6E

REHABILITATION

Public Inland Lake Protection and Rehabilitation, W77-03510 6E

REINFORCEMENT

Plastic-Reinforced Asphalt Seepage Barrier, W77-03120 3B

REMOTE SENSING

Radio-Echo Layers and the Recent Stability of the West Antarctic Ice Sheet, W77-03100 2C

Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies, W77-03277 7B

Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A

The Aerial Photo-Water Quality Link, W77-03471 5A

RENOVATION

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

REPRODUCTION

Effects of Oil Pollution on Breeding Grey Seals, W77-03187 5C

REPRODUCTIONS

Effects on Fertilization and Development of the Common Mussel, *Mytilus Edulis* After Long-Term Exposure to a Nonionic Surfactant, W77-03198 5C

RESEARCH AND DEVELOPMENT

Annual Report, 1975-1976, (Hawaii Water Resources Research Center), W77-03165 9D

Report on Tenth Annual Water Resources Research Conference, Sponsored by Office of Water Research and Technology, April 9-10, 1975, W77-03206 9D

RESEARCH PRIORITIES

Report on Tenth Annual Water Resources Research Conference, Sponsored by Office of Water Research and Technology, April 9-10, 1975, W77-03206 9D

RESERVOIR OPERATION

Probable Maximum Flood at Lake Chippewa near Winter, Wisconsin, W77-03349 4A

RESERVOIR RELEASES

Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A

A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03151 4A

SUBJECT INDEX

RESOURCES DEVELOPMENT

RESERVOIRS

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio.
W77-03174 4A

Allatoona Lake, Destratification Equipment Test, Appendix A, Operational and Water Quality Data, 1968.
W77-03307 5G

Allatoona Lake, Destratification Equipment Test, Appendix B, Operational and Water Quality Data, 1969.
W77-03308 5G

Allatoona Lake, Destratification Equipment Test, Appendix C, Operational and Water Quality Data, 1970.
W77-03309 5G

Allatoona Lake, Destratification Equipment Test, Appendix D, Effects of Artificial Destratification on Temperature and Dissolved Oxygen in Allatoona Reservoir.
W77-03310 5G

Landslide Generated Water Wave Model,
W77-03318 8B

RESIDENCE TIME

Coastal Region Residence Time Estimates from Concentration Gradients,
W77-03093 5C

RESOURCE MANAGEMENT

The Legal Framework for Public Participation in Canadian Water Management,
W77-03543 6E

RESOURCES DEVELOPMENT

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea,
W77-03217 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska,
W77-03218 5C

Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas,
W77-03222 5B

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria,
W77-03223 5C

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf,
W77-03224 5B

Microbial Release of Soluble Trace Metals from Oil Impacted Sediments,
W77-03225 5C

Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea,
W77-03226 5B

Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography,
W77-03227 5B

Current Measurements in the Beaufort Sea,
W77-03228 2L

Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas,
W77-03229 5C

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop),
W77-03230 6G

Numerical Studies of Alaskan Region,
W77-03231 5B

Bristol Bay Oceanographic Processes (B-BOP),
W77-03232 5B

STD Mappings of the Beaufort Sea Shelf,
W77-03233 2L

Outer Continental Shelf Energy Program,
W77-03234 5B

Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska,
W77-03235 5B

Mesoscale Currents and Water Masses in the Gulf of Alaska,
W77-03236 5B

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program,
W77-03237 5A

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska,
W77-03238 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas,
W77-03239 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases,
W77-03240 5B

Physical Oceanography of the Gulf of Alaska,
W77-03241 5B

Near-Shore Atmospheric Modification,
W77-03242 5B

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea,
W77-03243 2L

Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation),
W77-03244 5B

The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain,
W77-03246 2L

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea,
W77-03247 2C

Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf,
W77-03248 2L

Offshore Permafrost Studies, Beaufort Sea,
W77-03249 2L

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions,
W77-03250 2L

Surface Current Observations - Beaufort Sea, 1972,
W77-03251 2L

Distribution and Character of Icings in Northeastern Alaska,
W77-03252 2C

A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs,
W77-03253 5B

Heavy-Mineral Trends in the Beaufort Sea,
W77-03254 2L

Yukon Delta Coastal Processes Study,
W77-03255 2L

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin,
W77-03256 2L

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska,
W77-03257 2L

Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska,
W77-03258 2L

Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska,
W77-03259 2L

Seismic and Volcanic Risk Studies - Western Gulf of Alaska,
W77-03260 2L

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models,
W77-03261 5B

Beaufort Seacoast Permafrost Studies,
W77-03262 2C

Benthos-Sedimentary Substrate Interactions,
W77-03263 5C

Faulting and Instability of Shelf Sediments - Western Gulf of Alaska,
W77-03264 2L

A Historical Summary of Earthquake Epicenters in and Near Alaska,
W77-03265 7C

A Study of Beaufort Sea Coastal Erosion - Northern Alaska,
W77-03266 2L

The Interaction of Oil with Sea Ice in the Arctic Ocean,
W77-03267 5C

Dynamics of Near-Shore Ice,
W77-03268 2C

Dynamics of Near-Shore Ice (Data Buoys),
W77-03269 2C

Study of Climatic Effects on Fast Ice Extent and its Seasonal Decay Along the Beaufort Sea Coast,
W77-03270 2C

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice,
W77-03271 2L

Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing,
W77-03272 2C

SUBJECT INDEX

RESOURCES DEVELOPMENT

- Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03273 2C
- Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures, W77-03274 2C
- Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study, W77-03275 2C
- Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice, W77-03276 2C
- Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies, W77-03277 7B
- RESPIRATION**
- Effect of Temperature and Salinity on Extension of Siphons by *Mercenaria Mercenaria*, W77-03205 5C
- RESPIROMETERS**
- The Electrolytic Respirometer - I. Factors Affecting Oxygen Uptake Measurements, W77-03457 5A
- RESUSPENSION**
- Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary, W77-03091 2L
- RETRANSMISSION**
- Retransmission of Hydrometric Data in Canada, W77-03111 7B
- REVEGETATION**
- Feasibility of Transplantation, Revegetation, and Restoration of Eelgrass in San Diego Bay, California, W77-03546 5G
- REVERSE OSMOSIS**
- One Pass Seawater Desalting RO Pilot Plant Evaluation, W77-03076 3A
- Studies on a Mechanism for Salt Rejection in Reverse Osmosis Membranes as a Guide to Improved Materials for Desalination of Sea Water, W77-03290 3A
- REVIEWS**
- Piping in Earth Dams Constructed of Dispersive Clay: Literature Review and Design of Laboratory Tests, W77-03112 8D
- RHODE ISLAND**
- Providence and Worcester Company V. Exxon Corporation (Right-of-Way in Land Submerged in Tidewater), W77-03496 6E
- RIGHT-OF-WAY**
- Specific Grants of Power (Condemnation and Rights-of-Way), W77-03493 6E
- Providence and Worcester Company V. Exxon Corporation (Right-of-Way in Land Submerged in Tidewater), W77-03496 6E
- Freedom of Beach, W77-03584 6E
- RIPARIAN RIGHTS**
- Water Rights, W77-03599 6E
- RIVER BASINS**
- Hydrologic Inventory of the San Rafael Study Unit, W77-03552 4A
- RIVER FLOW**
- Evaluation of Lake Milner Water Quality Model, W77-03373 5B
- RIVER ICINGS**
- Distribution and Character of Icings in Northeastern Alaska, W77-03252 2C
- RIVERS**
- Bear River Evaluation Report, 1974 Survey, W77-03292 5B
- Scour Around Bridge Piers, W77-03294 8B
- Flow Dynamics of the Neuse River Estuary, W77-03300 2L
- Environmental Inventory and Assessment of Navigation Pools 24, 25, and 26, Upper Mississippi and Lower Illinois Rivers; An Electrofishing Survey of the Illinois River, W77-03302 8I
- Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices, W77-03351 5A
- The Impact of Fargo, North Dakota's Waste Discharges on the Interstate Waters of the Red River of the North, September 1969-April 1970, W77-03361 5B
- ROCKFILL DAMS**
- Earth and Rock-Fill Dams: Basis of Their Design and Construction, Second Edition, W77-03102 8D
- ROOT SYSTEMS**
- Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function, W77-03315 2G
- ROTATING BIOLOGICAL FILTERS**
- The Rotating Biological Filter, W77-03282 5D
- ROTOR AERATORS**
- The Rotor Aerator: Growing Use In U.S. Waste-Treatment Plants, W77-03428 5D
- ROW DIRECTION**
- Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D
- ROW SPACING**
- Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D
- RUNOFF**
- OPTRM - A Hydrologic Transport Model With Parameter Optimization, W77-03115 5B
- Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts, W77-03178 4A
- SACRAMENTO COUNTY (CALIF)**
- Meeting Water Demands in Sacramento County, W77-03553 6D
- SACRAMENTO-SAN JOAQUIN DELTA (CALIF)**
- Plan for Improvement of the Delta Levees, W77-03550 4A
- SAFETY**
- Mechanical Mole Burrows Sewer Tunnel, W77-03397 8C
- SAGINAW BAY (MICH)**
- Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A
- SALINE LAKES**
- Chemistry of Salt Lakes and Other Waters in the Sub-Humid Regions of Tasmania (Australia), W77-03284 2H
- Stability of Ionic Proportions in Five Salt Lakes in Victoria, Australia, W77-03285 2H
- Chemical Composition of Some Inland Surface Waters in South, Western, and Northern Australia, W77-03286 2K
- SALINE SOILS**
- Factors of Soil Salinization During Irrigation in the Turan Lowland, (In Russian), W77-03124 2G
- SALINE WATER BARRIERS**
- Ground Water Basin Protection Projects: Fremont Salinity Barrier, W77-03555 4B
- SALINITY**
- The Bottom Boundary Layer of the Deep Ocean, W77-03089 2L
- Ecology of Aquatic Saprophytic Phycocyanes. II, (In Russian), W77-03201 5C
- Effect of Temperature and Salinity on Extension of Siphons by *Mercenaria Mercenaria*, W77-03205 5C
- Salinity Induced Horizontal Estuarine Circulation, W77-03312 2L
- SALINITY GRADIENTS**
- Salinity Induced Horizontal Estuarine Circulation, W77-03312 2L
- SALMONELLA**
- Sanitary-Bacteriological Study of the Effectiveness of Decontaminating the Sewage of Voroshilovgrad on Sewage Farms, (In Russian), W77-03128 5D
- SALMONIDS**
- Reproduction by Adfluvial Salmonids in Spaw Creek, Cache County, Utah, W77-03160 2I
- SALT CREEK (NB)**
- Flood Plain Information: Metropolitan Region, Lincoln, Nebraska: Volume I, Summary Report; Salt Creek, Haines Branch and Beal Slough, Salt Creek Basin, W77-03179 4A

SUBJECT INDEX

SEDIMENT TRANSPORT

- Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin. W77-03181 4A
- SALT TOLERANCE**
Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in *Anodonta Cygnaea*, (In Russian), W77-03366 5C
- SAMPLING**
Nature Preservation Activity RR Investigation: Part 6. A Modified Method of Measuring the Chemical Oxygen Demand Gives a High Analytical Capacity, (In Swedish), W77-03589 5A
- SAN ANTONIO AREA (TEX)**
Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968 - January 1975, W77-03343 5A
- SAN BERNARDINO VALLEY AREA (ARIZ)**
Maps Showing Ground-Water Conditions in the San Bernardino Valley Area Cochise County, Arizona--1975, W77-03328 7C
- SAN DIEGO BAY (CALIF)**
Feasibility of Transplantation, Revegetation, and Restoration of Eelgrass in San Diego Bay, California, W77-03546 5G
- SAN JUAN RIVER (NM)**
Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico. W77-03176 4A
- SAN RAFAEL RIVER (UTAH)**
Hydrologic Inventory of the San Rafael Study Unit. W77-03552 4A
- SAN SIMON AREA (ARIZ)**
Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico--1975, W77-03327 7C
- SAND WAVES**
Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States, W77-03332 2L
- SANDS**
Relationships Between Sand Input from Rivers and the Composition of Sands from the Beaches of Southern California, W77-03324 2L
Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States, W77-03332 2L
- SANTA CLARA RIVER (CALIF)**
Relationships Between Sand Input from Rivers and the Composition of Sands from the Beaches of Southern California, W77-03324 2L
- SATELLITES (ARTIFICIAL)**
Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A
- SATURATED FLOW**
Piping in Earth Dams Constructed of Dispersive Clay; Literature Review and Design of Laboratory Tests, W77-03112 8D
On the Validity of the Theory of Flow in Saturated Swelling Materials, W77-03280 2G
Supplement to Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow, W77-03329 2F
- SCIOTO RIVER (OH)**
Flood Plain Information: Scioto and Olentangy Rivers, Ohio, Columbus Area, Summary Report. W77-03183 4A
- SCOUR**
Scour Around Bridge Piers, W77-03294 8B
- SCRAM**
Simulation of Pesticide Movement on Small Agricultural Watersheds, W77-03540 5B
- SCREENS**
Screening Apparatus for Removal of Solids - From Sewage with Rotating Screen and Vertical Lift for Residues. W77-03403 5D
- SEA BIRDS**
Litter and Oil on the Shores of Utsira, Rogaland County, During Autumn 1974, (In Danish), W77-03125 5B
- SEA ICE**
The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C
Dynamics of Near-Shore Ice, W77-03268 2C
Dynamics of Near-Shore Ice (Data Buoys), W77-03269 2C
Study of Climatic Effects on Fast Ice Extent and its Seasonal Decay Along the Beaufort Sea Coast, W77-03270 2C
Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03272 2C
Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing, W77-03273 2C
Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures, W77-03274 2C
Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study, W77-03275 2C
Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice, W77-03276 2C
Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies, W77-03277 7B
- SEA URCHINS**
Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C
- SEAL PUPS**
Effects of Oil Pollution on Breeding Grey Seals, W77-03187 5C
- SEALS**
Effects of Oil Pollution on Breeding Grey Seals, W77-03187 5C
- SEASONAL**
Seasonal Demarcation in Pennsylvania for Hydrological Use, W77-03127 2B
- SEASONS**
Seasonal Demarcation in Pennsylvania for Hydrological Use, W77-03127 2B
- SEATTLE (WASH)**
A Study of the Suspended Particulate Problem in the Duwamish Basin, W77-03291 5A
- SEAWEEDES**
Effects of Oil on Beaches in West Cork, Ireland, W77-03192 5C
- SECONDARY FLOW**
Flow and Bed Topography in Curved Open Channels, W77-03084 8B
- SECONDARY SETTLING TANKS**
Dynamic Response of Final Settling Tanks to Transient Loading Conditions, W77-03156 5D
- SEDIMENT MERCURY CONCENTRATIONS**
Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment, W77-03188 5B
- SEDIMENT TRANSPORT**
Minimum Unit Stream Power and Fluvial Hydraulics, W77-03080 8B
Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska, W77-03245 2L
Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf, W77-03248 2L
Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L
Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L
Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska, W77-03258 2L
Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies, W77-03277 7B
Computer Programs for Sediment Transport, Documentation and Listing, W77-03298 2J

SUBJECT INDEX

SEDIMENT TRANSPORT

Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States, W77-03332 2L

SEDIMENTARY STRUCTURES

High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida, W77-03344 7B

SEDIMENTATION

Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B

Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska, W77-03258 2L

Nature and Genesis of Some Storm Washover Deposits, W77-03293 2L

Computer Programs for Sediment Transport, Documentation and Listing, W77-03298 2J

SEDIMENTATION RATES

Variations of Coliform Bacteria and Other Pollution Indices in Surface Waters, W77-03539 5B

Experiments on Wastewater Sedimentation, W77-03574 5D

SEDIMENTS

Faulting and Instability of Shelf Sediments - Western Gulf of Alaska, W77-03264 2L

A Study of Beaufort Sea Coastal Erosion - Northern Alaska, W77-03266 2L

Sediment Mass Balance of a Large Estuary, Long Island Sound, W77-03323 2L

SEEDS

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower, W77-03135 3F

Experimental Ecology of Selected Vertebrate Species, W77-03564 6G

SEEPAGE

Plastic-Reinforced Asphalt Seepage Barrier, W77-03120 3B

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf, W77-03224 5B

SEISMIC PROPERTIES

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

SEISMIC REFRACTION

Beaufort Seacoast Permafrost Studies, W77-03262 2C

SEISMIC STUDIES

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L

Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida, W77-03344 7B

SEPARATION TECHNIQUES

Centrifuge for Dewatering Sewage Sludge, W77-03410 5D

Recent Developments in the Use of Polyelectrolytes, W77-03569 5D

SEPTIC TANKS

Groundwater Quality Adjacent to a Septic Tank System, W77-03456 5D

SETTLING BASINS

Dynamic Response of Final Settling Tanks to Transient Loading Conditions, W77-03156 5D

Effect of Variable Loading on Oxygen Uptake, W77-03473 5D

SEWAGE

Reactions of Heavy Metals With Soils With Special Regard to Their Application in Sewage Wastes, W77-03359 5B

Marine Sanitation Device Standard, W77-03531 5G

SEWAGE BACTERIA

Virus and Bacterial Removal from Waste Water by Land Treatment, W77-03447 5D

SEWAGE DISPOSAL

The Effects of Sewage Effluent on Wetland Ecosystems, W77-03354 5C

Innovation is an Old Idea--With A Big Future, W77-03482 5D

Individual Sewage Disposal System Act, W77-03491 6E

SEWAGE EFFLUENTS

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides, W77-03132 5D

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

Behavior of Ground Water Subject to Irrigation of Effluent - A Case Study, W77-03158 5D

Keep Cool with Sewage Effluent - A Two-Way Saving of Water, W77-03578 3E

SEWAGE SLUDGE

Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography, W77-03358 5B

Centrifuge for Dewatering Sewage Sludge, W77-03410 5D

Combined Process of Pyrolysis and Combustion for Sludge Disposal, W77-03415 5D

Sludge Incineration, W77-03419 5E

Sewage Sludge Treatment System, W77-03487 5D

Fluidized Waste Incinerator and Method, W77-03489 5D

Sludge Drying Beds are Practical: Part 2, W77-03572 5D

SEWAGE TREATMENT

The Rotating Biological Filter, W77-03282 5D

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D

The Impact of Fargo, North Dakota's Waste Discharges on the Interstate Waters of the Red River of the North, September 1969-April 1970, W77-03361 5B

Screening Apparatus for Removal of Solids - From Sewage with Rotating Screen and Vertical Lift for Residues, W77-03403 5D

Biological Treatment of Sewage Waters - Device with Internal Aeration Zone, W77-03404 5D

Sludge Collector and Light Liquid Separator - From Sewage with Two Tanks in Single Housing and Cover, W77-03405 5D

Sewerage Treatment Apparatus, W77-03406 5D

Biological Purification of Sewage Water-In a Multi-Stage Treatment Tank With Rotating Contactor Surfaces Partly Immersed in the Liquid, W77-03407 5D

Biological Converter for Faecal Matter in Water - Using Rotary Tubes With Fibrous Filling Supporting the Bacterial Culture, W77-03409 5D

Centrifuge for Dewatering Sewage Sludge, W77-03410 5D

Toxicity of Ammonia to Algae in Sewage Oxidation Ponds, W77-03413 5D

Sludge Incineration, W77-03419 5E

Origin of Nitrogen Pollution in Surface and Waste Waters (Origines Des Pollutions Azotées Dans Les Eaux Superficielles Et Les Eaux Usées), W77-03423 5D

SUBJECT INDEX

SHRUBS

The Rotor Aerator: Growing Use In U.S. Waste-Treatment Plants. W77-03428 5D

U. S. Air Force Greens Colorado. W77-03431 5D

Shelters Boost Winter Treatment Efficiencies. W77-03432 5D

Behaviour in Conventional Sewage Purification Processes of Coliform Bacteria with Transferable or Non-Transferable Drug-Resistance. W77-03435 5D

Sewage Plant for British Virgin Islands. W77-03437 5D

Small Village Gets Advanced Treatment. W77-03440 5D

Large Scale Sewage Treatment Plant with Sludge Incinerator. W77-03442 5D

Virus and Bacterial Removal from Waste Water by Land Treatment. W77-03447 5D

Tertiary Treatment of Sewage Effluents. W77-03453 5D

Cyanophage Analysis as a Biological Pollution Indicator-Bacterial and Viral. W77-03460 5A

A Study of Mixing Characteristics of Sewage Stabilization Ponds with Radioactive Tracers. W77-03461 5D

Use of Intrinsically Safe Instrumentation. W77-03462 5A

Laboratory Studies on the Effects of Temperature on Accumulation of Solids in Biological Filters. W77-03464 5D

Nitrate Monitoring. W77-03468 5A

The Limitation of the Ratio of Fecal Coliforms to Total Coliphage as a Water Pollution Index. W77-03472 5A

Transferable Drug Resistance Associated with Coliforms Isolated from Hospital and Domestic Sewage. W77-03478 5A

Innovation is an Old Idea--With A Big Future. W77-03482 5D

Grant Aid for Plant Operations: An Evaluation. W77-03483 5G

Sewage Sludge Treatment System. W77-03487 5D

Fluidized Waste Incinerator and Method. W77-03489 5D

Individual Sewage Disposal System Act. W77-03491 6E

Recent Developments in the Use of Polyelectrolytes. W77-03569 5D

Sodium Bicarbonate Neutralizes. W77-03570 5D

Sludge Drying Beds are Practical: Part 2. W77-03572 5D

Flotation for Water and Wastewater Treatment. W77-03576 5D

SEWERAGE

Ductile Iron Pipe Solves a Tough Sewer Problem at Jimerson Creek. W77-03398 8G

Innovations in Sewer Design and Construction. W77-03399 8G

Precautions to be Taken in the Construction and Maintenance of Water Supply and Sewer Systems (Precautions a Prendre Dans La Construction Et L'Entretien Des Reseaux D' Aqueduc Et D' Egout). W77-03400 8G

The Rotor Aerator: Growing Use In U.S. Waste-Treatment Plants. W77-03428 5D

U. S. Air Force Greens Colorado. W77-03431 5D

Shelters Boost Winter Treatment Efficiencies. W77-03432 5D

Behaviour in Conventional Sewage Purification Processes of Coliform Bacteria with Transferable or Non-Transferable Drug-Resistance. W77-03435 5D

Large Factory-Built Pump Station Begins Operation. W77-03438 8C

Large Scale Sewage Treatment Plant with Sludge Incinerator. W77-03442 5D

A New Method of Automatic Determination of Nitrate in Waste Waters and Polluted Surface Waters (Ein Neues Verfahren Zur Automatischen Nitrat-Bestimmung in Abwaessern und Belasteten Oberflaechenwaessern). W77-03466 5A

The Limitation of the Ratio of Fecal Coliforms to Total Coliphage as a Water Pollution Index. W77-03472 5A

Investigation of Oxygen Transfer to Slime as a Surface Reaction. W77-03476 5B

Transferable Drug Resistance Associated with Coliforms Isolated from Hospital and Domestic Sewage. W77-03478 5A

Grant Aid for Plant Operations: An Evaluation. W77-03483 5G

Aerosol Production by Irrigation Equipment Used for Land Application of Waste Water. W77-03484 5A

Risk of Communicable Disease Infection Associated with Waste Water Irrigation in Agricultural Settlements. W77-03485 5C

Recent Developments in the Use of Polyelectrolytes. W77-03569 5D

Sodium Bicarbonate Neutralizes. W77-03570 5D

Flotation for Water and Wastewater Treatment. W77-03576 5D

Conducting Sewer System Evaluations for Small Systems. W77-03581 5D

SEWERS

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio. W77-03353 5D

Mechanical Mole Burrows Sewer Tunnel. W77-03397 8C

Infiltration/Inflow Improvements in the Oyster Bay Sewer District. W77-03401 5D

Infiltration/Inflow - The Kansas Connection. W77-03479 5G

Conducting Sewer System Evaluations for Small Systems. W77-03581 5D

SEYCHELLES

Rainfall in the Seychelles 1941 to 1970. W77-03096 2B

SHALLOW AQUIFERS

High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida. W77-03344 7B

SHEAR RIDGES

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice. W77-03271 2L

SHELLFISH

Effects of Crude Oil on American Lobster (Homarus Americanus) Larvae in the Laboratory. W77-03197 5C

SHIGELLAS

Sanitary-Bacteriological Study of the Effectiveness of Decontaminating the Sewage of Voroshilovgrad on Sewage Farms. (In Russian). W77-03128 5D

SHIPS

Distribution and Source of Tar on the Pacific Ocean. W77-03191 5B

Ship-to-Shore Sewage Hose Handling Tests. W77-03364 5D

Marine Sanitation Device Standard. W77-03531 5G

Unions Fight a Jones Act Waiver. W77-03532 6E

SHORE PROTECTION

1971 Shoreline Management Act. W77-03514 6E

The Cost of Coastal Zoning. W77-03535 6E

SHRIMP

Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp. W77-03186 5C

SHRUBS

A Comparison of Seasonal Primary Production of Mojave Desert Shrubs During Wet and Dry Years. W77-03138 2I

SUBJECT INDEX

SHRUBS

Comparative Photosynthetic Production of Mojave Desert Shrubs, W77-03141 2D

SIDE WEIRS

Experimental Investigation of Flow Over Side Weirs, W77-03317 8B

SIERRA NEVADA REGION

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary, W77-03212 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume I - Meteorology and Hydrology of the Northern Sierra Nevada, Final Report, W77-03213 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume II - Physical and Statistical Design, Final Report, W77-03214 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume III - Operational Design, Final Report, W77-03215 3B

SILT REMOVAL

Silt Removal from a Lake Bottom, W77-03392 5C

SILTS

Silt Removal from a Lake Bottom, W77-03392 5C

SIMULATION

Low Flow Modeling in Small Steep Watersheds, W77-03316 4D

SIMULATION ANALYSIS

Dynamic Response of Final Settling Tanks to Transient Loading Conditions, W77-03156 5D

Probable Maximum Flood at Lake Chippewa near Winter, Wisconsin, W77-03349 4A

Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices, W77-03351 5A

Useful Modeling Concepts for the FCD Water System, W77-03524 6A

Simulation of Pesticide Movement on Small Agricultural Watersheds, W77-03540 5B

SINKS

Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A

SIPHONS

Effect of Temperature and Salinity on Extension of Siphons by Mercenaria Mercenaria, W77-03205 5C

SLIME

Pollution of Interstate Waters of the Lower Columbia River Bonneville Dam to Cathlamet, Washington, W77-03385 5B

The Influence of Carbon-Nitrogen Ratio on the Chlorination of Microbial Aggregates, W77-03414 5D

Investigation of Oxygen Transfer to Slime as a Surface Reaction, W77-03476 5B

A Study of Substrate Removal in a Microbial Film Reactor, W77-03480 5D

SLUDGE

Heat Inactivation of Poliovirus in Waste Water Sludge, W77-03448 5C

SLUDGE CHARACTERISTICS

Characterization and Dewaterability of Water Treatment Plant Residues, W77-03130 5D

SLUDGE DISPOSAL

Land Based Sewage Sludge Management Alternatives for Los Angeles: Evaluation and Comparison, W77-03289 5D

Sludge Collector and Light Liquid Separator-From Sewage with Two Tanks in Single Housing and Cover, W77-03405 5D

Combined Process of Pyrolysis and Combustion for Sludge Disposal, W77-03415 5D

Sludge Incineration, W77-03419 5E

Use of Sludge Left After Waste Water Decantation as a Fertilizer or Soil Conditioner (Les Boues de Decantation d Eau Residuaires Utilisees Comme Fertilisant ou Comme Conditionneur de Sols), W77-03421 5D

Sludge - Where Will We Put It, W77-03424 5E

Fluidized Waste Incinerator and Method, W77-03489 5D

Wastewater's Future is Cloudy, W77-03577 5D

SLUDGE TREATMENT

Characterization and Dewaterability of Water Treatment Plant Residues, W77-03130 5D

A Butane Freezing Process for Dewatering Sludge, W77-03153 5D

Liming Farmland with Calcium Sludge, W77-03163 5D

System for Dewatering Dilute Slurries, W77-03352 5D

Sludge Collector and Light Liquid Separator-From Sewage with Two Tanks in Single Housing and Cover, W77-03405 5D

Centrifuge for Dewatering Sewage Sludge, W77-03410 5D

Sludge Dewatering Pilot Plant Design, Part I, W77-03416 5D

Sludge Incineration, W77-03419 5E

Sludge - Where Will We Put It, W77-03424 5E

Design and Control of Nitrifying Activated Sludge Systems, W77-03426 5D

Minimizing the Waste Discharges from Water Treatment Plants, W77-03455 5D

SLURRY FREEZING

A Butane Freezing Process for Dewatering Sludge, W77-03153 5D

SMALL ANIMALS (MAMMALS)

Experimental Ecology of Selected Vertebrate Species, W77-03564 6G

SNAKE RIVER (IDAHO)

Evaluation of Lake Milner Water Quality Model, W77-03373 5B

SNOW AUGMENTATION

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume III - Operational Design, Final Report, W77-03215 3B

SNOWPACKS

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume III - Operational Design, Final Report, W77-03215 3B

SOCIAL ASPECTS

Residual Waste Management Research and Planning Projects, September 1975, W77-03355 5B

SOFT SOIL

Undrained Behavior of Embankments on New Liskeard Varved Clay, W77-03108 8D

SOIL CHEMICAL PROPERTIES

Reactions of Heavy Metals With Soils With Special Regard to Their Application in Sewage Wastes, W77-03359 5B

SOIL CONTAMINATION EFFECTS

Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois, W77-03565 5A

SOIL MATRIC POTENTIAL

Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matric Potential and Microclimate, W77-03394 3F

SOIL MOISTURE

Cultivation and Breeding of Oenothera-Plant: IV. Effect of Soil Moisture on Growth and Components in Seed of O. Biennis, (In Japanese), W77-03148 2I

SUBJECT INDEX

STATISTICAL ANALYSIS

SOIL PHYSICAL PROPERTIES

Simulation of Pesticide Movement on Small Agricultural Watersheds, W77-03540 5B

SOIL WATER

Effect of Water Stress on the Phasic Development of Annual Medicago Species, W77-03136 2I

Effects of Soil-Moisture Regimes on the Growth of Barley, W77-03216 3F

Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function, W77-03315 2G

SOIL WATER MOVEMENT

On the Validity of the Theory of Flow in Saturated Swelling Materials, W77-03280 2G

Infiltration and Water Movement in an In Situ Swelling Soil During Prolonged Ponding, W77-03281 2G

Prediction of Water Transmission in Conditioned Soils, W77-03451 2G

SOIL-WATER-PLANT RELATIONSHIPS

Effect of Water Stress on the Phasic Development of Annual Medicago Species, W77-03136 2I

Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D

Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function, W77-03315 2G

SOIL WATER STORAGE

Low Flow Modeling in Small Steep Watersheds, W77-03316 4D

SOILS

Measurement of Nonexchanging Pores During Miscible Displacement in Soils, W77-03320 2G

Calibration of Neutron Probe in Some Selected Hawaiian Soils, W77-03321 2G

Prediction of Water Transmission in Conditioned Soils, W77-03451 2G

SOLID WASTES

Screening Apparatus for Removal of Solids - From Sewage with Rotating Screen and Vertical Lift for Residues, W77-03403 5D

Minimizing the Waste Discharges from Water Treatment Plants, W77-03455 5D

SONAR

A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs, W77-03253 5B

SOUNDS

Seasonal Variation of Residual Drift in Long Island Sound, W77-03322 2L

Sediment Mass Balance of a Large Estuary, Long Island Sound, W77-03323 2L

SOUTH DAKOTA

Suitability of Lagoon Effluents for Irrigation in South Dakota, W77-03152 5D

Silt Removal from a Lake Bottom, W77-03392 5C

SOUTHEAST US

Multiple Use in the Southern Coastal Plains in the United States, W77-03173 4C

SPAWN CREEK (UTAH)

Reproduction by Adfluvial Salmonids in Spawn Creek, Cache County, Utah, W77-03160 2I

SPAWNING

Effects on Fertilization and Development of the Common Mussel, Mytilus Edulis After Long-Term Exposure to a Nonionic Surfactant, W77-03198 5C

SPECTRAL ANALYSIS

High-Wave Conditions Observed Over the North Atlantic in September 1961, W77-03090 2L

SPECTROSCOPY

Studies on a Mechanism for Salt Rejection in Reverse Osmosis Membranes as a Guide to Improved Materials for Desalination of Sea Water, W77-03290 3A

SPILLWAYS

Experimental Investigation of Flow Over Side Weirs, W77-03317 8B

SPOIL BANKS

Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota, W77-03094 5C

SPORLEY LAKE (MICH)

Response of Daphnia Population Size and Age Structure to Predation, W77-03390 2H

SPRAY CHARGE

Electrostatic Induction Parameters to Attain Maximum Spray Charge to Clear Fog, W77-03299 3B

SPRAY IRRIGATION

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

Behavior of Ground Water Subject to Irrigation of Effluent - A Case Study, W77-03158 5D

SPRAYS

Electrostatic Induction Parameters to Attain Maximum Spray Charge to Clear Fog, W77-03299 3B

ST. GEORGE BASIN

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L

ST. GEORGE SOUND (FLA)

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida, W77-03304 2L

ST LAWRENCE RIVER

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary, W77-03091 2L

ST LAWRENCE SEAWAY

Great Lakes Compact Commission, W77-03513 6E

ST. LOUIS (MO)

Relation Between Atmospheric Pollution, Precipitation, and Streamwater Quality Near A Large Urban-Industrial Complex, W77-03097 5B

ST. MARGARET'S BAY (NOVA SCOTIA)

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

STABILITY

Photolysis of 5-Chlorouracil in Natural Waters, W77-03477 5B

STABILIZATION

A Study of Mixing Characteristics of Sewage Stabilization Ponds with Radioactive Tracers, W77-03461 5D

An Economic Evaluation of Deep Tank Aeration for Wastewater Treatment, W77-03580 5D

STANDARDS

Microbiological Examination of Waters and Effluents, W77-03470 5A

Paint Formulating Point Source Category Effluent Guidelines and Standards, W77-03526 5G

Organic Chemicals Manufacturing Point Source Category-Effluent Limitations and Guidelines (Amendments to Regulations-Butadiene), W77-03528 5G

Proposed Toxic Pollutant Effluent Standards, W77-03529 5G

Marine Sanitation Device Standard, W77-03531 5G

STATE GOVERNMENTS

Ditch Companies, W77-03501 6E

The Objectives, Part I of the State Water Plan, (Idaho Water Resources Board), W77-03544 6B

Water for Nevada. Water Planning Report, W77-03545 6B

STATE WATER QUALITY INVENTORY

(DELAWARE) Delaware 1975 State Water Quality Inventory, W77-03378 5G

STATISTICAL ANALYSIS

Correlation Analysis of Hydrometeorological Data, W77-03086 2A

Wet and Dry Periods of Annual Flow Series, W77-03319 2E

STATISTICAL ANALYSIS

STATISTICAL METHODS

Correlation Analysis of Hydrometeorological Data,
W77-03086 2A

STEVENS CREEK (NB)

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin.
W77-03181 4A

STOMATA

Water Stress Induced Alterations of the Stomatal Response to Decreases in Leaf Water Potential,
W77-03140 2I

Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions,
W77-03142 2D

STORM DRAINS

Application of a Model for Layout and Design of Sewer Systems,
W77-03133 5B

STORM SYNTHESIS

Hydrologic Engineering Methods for Water Resources Development, Volume 5, Hypothetical Floods,
W77-03104 8B

STORM TIDES

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida,
W77-03304 2L

STORM TRANSPORTATION

Hydrologic Engineering Methods for Water Resources Development, Volume 5, Hypothetical Floods,
W77-03104 8B

STORMS

Hydrologic Engineering Methods for Water Resources Development, Volume 5, Hypothetical Floods,
W77-03104 8B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary,
W77-03212 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume I - Meteorology and Hydrology of the Northern Sierra Nevada, Final Report.
W77-03213 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume II - Physical and Statistical Design, Final Report.
W77-03214 3B

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida,
W77-03304 2L

STRATIFICATION

Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir,
W77-03129 4A

SUBJECT INDEX

A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir,
W77-03151 4A

STREAMFLOW

Relation Between Atmospheric Pollution, Precipitation, and Streamwater Quality Near A Large Urban-Industrial Complex,
W77-03097 5B

Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas,
W77-03229 5C

STREAMFLOW FORECASTING

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio,
W77-03174 4A

STREAMS

Aquatic Field Survey at Iowa Army Ammunition Plant,
W77-03386 5C

STRENGTH OF MATERIALS

Strength of Ice Under Multiaxial Loading,
W77-03301 2C

STRESS

Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*),
W77-03203 5C

STRIP MINE LAKES

Limnological Characteristics of Strip Mine Ponds in Northwestern Colorado, U.S.A.,
W77-03538 5C

SUBLETHAL EFFECTS

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory,
W77-03197 5C

Effects on Fertilization and Development of the Common Mussel, *Mytilus Edulis* After Long-Term Exposure to a Nonionic Surfactant,
W77-03198 5C

Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*),
W77-03203 5C

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*),
W77-03204 5C

SULFIDES

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides,
W77-03132 5D

SUNFISHES

Distribution and Feeding of Pumpkinseed (*Lepomis gibbosus*) and Black Crappie (*Pomoxis nigromaculatus*) in a power plant cooling lake,
W77-03078 5C

SUNFLOWER

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower,
W77-03135 3F

SURF

Surf-Zone Water Quality in Liverpool Bay,
W77-03092 5B

SURF-ZONE

Surf-Zone Water Quality in Liverpool Bay,
W77-03092 5B

SURFACE DRAINAGE

Glassman V. Weldin Farms, Inc. (No Right in Upper Land Owner to Artificially Increase the Natural Drainage of Surface Water to Increase Flooding on Land of Lower Property).
W77-03518 6E

SURFACE-GROUNDWATER RELATIONSHIPS

Normal-Mode Analysis of the Structure of Baseflow Recession Curves,
W77-03313 2F

Meeting Water Demands in Sacramento County.
W77-03553 6D

SURFACE WATER

Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968 - January 1975,
W77-03343 5A

SURFACE WATERS

Aspects of the Chemical Variability of some Tasmanian Inland Waters (Australia),
W77-03283 2K

Chemical Composition of Some Inland Surface Waters in South, Western, and Northern Australia,
W77-03286 2K

Measurement of 'Turbidity' and Related Characteristics of Natural Waters,
W77-03339 7B

Glassman V. Weldin Farms, Inc. (No Right in Upper Land Owner to Artificially Increase the Natural Drainage of Surface Water to Increase Flooding on Land of Lower Property).
W77-03518 6E

SURFACTANTS

Effects on Fertilization and Development of the Common Mussel, *Mytilus Edulis* After Long-Term Exposure to a Nonionic Surfactant,
W77-03198 5C

SURVIVAL OF SEAL PUPS

Effects of Oil Pollution on Breeding Grey Seals,
W77-03187 5C

SURPLUS WATER

Suspension and Restoration of Right to Appropriate.
W77-03508 6E

SURVEYS

A Study of the Suspended Particulate Problem in the Duwamish Basin,
W77-03291 5A

Bear River Evaluation Report, 1974 Survey,
W77-03292 5B

Environmental Inventory and Assessment of Navigation Pools 24, 25, and 26, Upper Mississippi and Lower Illinois Rivers; An Electrofishing Survey of the Illinois River,
W77-03302 8I

Structure of the Glacier Charles Rabots Bre. Norway,
W77-03311 2C

Sediment Mass Balance of a Large Estuary, Long Island Sound,
W77-03323 2L

SUBJECT INDEX

TOXICITY

Precautions to be Taken in the Construction and Maintenance of Water Supply and Sewer Systems (Precautions a Prendre Dans La Construction Et L'Entretien Des Reseaux D' Aqueduc Et D' Egout),
W77-03400 8G

Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens,
W77-03590 6G

SUSPENDED SOLIDS

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary,
W77-03091 2L

A Study of the Suspended Particulate Problem in the Duwamish Basin,
W77-03291 5A

Variations of Coliform Bacteria and Other Pollution Indices in Surface Waters.
W77-03539 5B

SUTTER BASIN

A Three-Dimensional Finite Element Ground Water Model,
W77-03109 2F

SWIFT RIVER (MA)

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts.
W77-03178 4A

SWITZERLAND

The Phosphorus Pollution of Waters Due to Agriculture, (In German),
W77-03134 5B

Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French),
W77-03144 5C

SYNTHETIC DETERGENTS

The Effect of Detergents on Larval Development of a Crab,
W77-03189 5C

SYSTEMATICS

Experimental Studies on the Second Intermediate Hosts of Clonorchis Sinesis: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of Metacercariae of Clonorchis Sinesis in Freshwater Fish, (In Korean),
W77-03161 5C

SYSTEMS ANALYSIS

User Oriented Systems Analysis for Regional Municipal Water Supply Planning,
W77-03159 6A

TANKS

Experiments on Wastewater Sedimentation,
W77-03574 5D

TAR LUMPS

Distribution and Source of Tar on the Pacific Ocean,
W77-03191 5B

TASMANIA

Aspects of the Chemical Variability of some Tasmanian Inland Waters (Australia),
W77-03283 2K

Chemistry of Salt Lakes and Other Waters in the Sub-Humid Regions of Tasmania (Australia),
W77-03284 2H

TASTE

A Preliminary Study of the Taste and Odor Problems in Grand Lake, Ohio and the Wabash Rivers, Indiana,
W77-03384 5C

TEMPERATURE

The Bottom Boundary Layer of the Deep Ocean,
W77-03089 2L

Ecology of Aquatic Saprophytic Phycomycetes. II, (In Russian),
W77-03201 5C

Effect of Temperature and Salinity on Extension of Siphons by Mercenaria Mercenaria,
W77-03205 5C

Chlorine Disinfection of Treated Wastewater in a Baffled Contact Chamber at Less Than 1 C,
W77-03363 5D

Effect of Water Chlorination Upon Levels of Some Polynuclear Aromatic Hydrocarbons in Water,
W77-03459 5F

Laboratory Studies on the Effects of Temperature on Accumulation of Solids in Biological Filters,
W77-03464 5D

TERTIARY TREATMENT

Advanced Trickling Filter for Wastewater Treatment,
W77-03365 5D

Waste-Treatment 'Farm' Harvests Firms.
W77-03420 5D

Small Village Gets Advanced Treatment.
W77-03440 5D

Tertiary Treatment of Sewage Effluents,
W77-03453 5D

THAW LAKES

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska,
W77-03296 2C

THERMAL POLLUTION

Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin,
W77-03077 5C

Distribution and Feeding of Pumpkinseed (Lepomis gibbosus) and Black Crappie (Pomoxis nigromaculatus) in a power plant cooling lake,
W77-03078 5C

Calibration of a Thermal Enrichment Model for Shallow, Barricaded Estuaries,
W77-03171 5B

THERMAL PROPERTIES

Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin,
W77-03077 5C

Distribution and Feeding of Pumpkinseed (Lepomis gibbosus) and Black Crappie

(Pomoxis nigromaculatus) in a power plant cooling lake,
W77-03078 5C

THERMISTORS

Electronic Sensor for Low-to-Medium Windspeeds,
W77-03099 7B

THREE-DIMENSIONAL MODELS

A Three-Dimensional Finite Element Ground Water Model,
W77-03109 2F

THUNDER BAY (ONTARIO)

Coastal Region Residence Time Estimates from Concentration Gradients,
W77-03093 5C

TIDAL EFFECTS

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary,
W77-03091 2L

TIDES

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida,
W77-03304 2L

TIN

Hygienic Substantiation of the Maximum Permissible Concentration of Tin Tributylmethacrylate in Water Bodies, (In Russian),
W77-03107 5A

TOPOGRAPHY

Flow and Bed Topography in Curved Open Channels,
W77-03084 8B

TOTAL ORGANIC CARBON

Correlation Between BOD - TOC - TOD (Zusammenhang Zwischen BSE5 - TOC - TOD),
W77-03436 5D

TOTAL SUSPENDED MATTER

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary,
W77-03091 2L

TOWNSVILLE (QLD)

The Composition of Rainwater at Two Sites Near Townsville, Qld. (Australia),
W77-03279 2K

TOXICITY

Permissible Level of Benzo(A)Pyrene in Water Bodies, (In Russian),
W77-03117 5B

Effect of Zinc-Coated Culverts on Vertebrate and Invertebrate Fauna in Selected Maine Streams,
W77-03170 5C

Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp,
W77-03186 5C

The Effect of Detergents on Larval Development of a Crab,
W77-03189 5C

Influence of Illumination on Phytotoxicity of Crude Oil,
W77-03193 5C

SUBJECT INDEX

TOXICITY

Toxicity of Crude Oils and a Dispersant to the Stony Coral *Madracis Mirabilis*, W77-03196 5C

Effects of Crude Oil on American Lobster (*Homarus Americanus*) Larvae in the Laboratory, W77-03197 5C

TOXINS

Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water, W77-03474 5A

TRACE ELEMENTS

Heavy Metals in Lakes of the Coeur d'Alene River Valley, Idaho, W77-03207 5B

Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A

Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas, W77-03222 5B

Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois, W77-03565 5A

TRACERS

A Study of Mixing Characteristics of Sewage Stabilization Ponds with Radioactive Tracers, W77-03461 5D

TRANSFER

Ship-to-Shore Sewage Hose Handling Tests, W77-03364 5D

TRANSITION FLOW

Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A

A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03151 4A

TRANSPIRATION

Comparative Photosynthetic Production of Mojave Desert Shrubs, W77-03141 2D

Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions, W77-03142 2D

Changes in the Transpiration Rate and Leaf Water Content in Several Varieties of *Cryptomeria Japonica* Subjected to Water Stress, (In Japanese), W77-03155 2D

Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D

The Regulation of Transpiration Expenditure of Moisture by Plants with the Aid of Antitranspirants, (In Russian), W77-03475 3B

TRANSPIRATION CONTROL

The Regulation of Transpiration Expenditure of Moisture by Plants with the Aid of Antitranspirants, (In Russian), W77-03475 3B

TRANSPORTATION

Hydrology and Environmental Aspects of Erie Canal (1817-99), W77-03334 8B

TREATIES

A Closer Look at Some Issues for General Oceans Policy, Marine Environment, and Fisheries, W77-03585 6E

TREATMENT FACILITIES

The Rotating Biological Filter, W77-03282 5D

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D

The Impact of Fargo, North Dakota's Waste Discharges on the Interstate Waters of the Red River of the North, September 1969-April 1970, W77-03361 5B

Technical Assistance Project Greeley Wastewater Treatment Facility, Greeley, Colorado. June-July, 1972, W77-03368 5D

Integral Circular Wastewater Treatment Plant, W77-03411 5D

Denver's Headworks Reflects Complexity of System, W77-03412 5D

Concentric Waste-Treatment Plant Saves Land, Cuts Cost, W77-03427 5D

The Rotor Aerator: Growing Use In U.S. Waste-Treatment Plants, W77-03428 5D

Elemental Distribution Diagrams for Biological Wastewater Treatment, W77-03429 5D

Factors Affecting Powdered Carbon Treatment of a Municipal Wastewater, W77-03430 5D

U. S. Air Force Greens Colorado, W77-03431 5D

Shelters Boost Winter Treatment Efficiencies, W77-03432 5D

The Application of the Foam Fractionation Process to the Removal of Viruses. Part I. The Production of a Mathematical Model to Predict the Efficiency of Virus Removal, W77-03433 5D

Effluent Variability Estimation for Complete-Mix Activated Sludge Treatment Systems, W77-03434 5D

Sewage Plant for British Virgin Islands, W77-03437 5D

Small Village Gets Advanced Treatment, W77-03440 5D

Large Scale Sewage Treatment Plant with Sludge Incinerator, W77-03442 5D

Ultraviolet Disinfection: An Alternative to Chlorination, W77-03445 5D

Flow Equalization by Use of Aeration Tank Volume, W77-03446 5D

An Operator's Approach to Aerobic Digester Supernatant Disposal Problems, W77-03449 5D

Supernatant Decanting of Aerobically Digested Waste Activated Sludge, W77-03450 5D

Tertiary Treatment of Sewage Effluents, W77-03453 5D

Effect of Water Chlorination Upon Levels of Some Polynuclear Aromatic Hydrocarbons in Water, W77-03459 5F

Investigations on the Importance of the Organic Chloro-Compounds and their Adsorbability (Untersuchungen Zur Bedeutung der Organischen Chlorverbindungen und Ihrer Adsorbierbarkeit), W77-03465 5A

Nitrate Monitoring, W77-03468 5A

Infiltration/Inflow - The Kansas Connection, W77-03479 5G

Grant Aid for Plant Operations: An Evaluation, W77-03483 5G

The Cost of Producing Effluents to Varying Standards by Biological Treatment Techniques, W77-03568 5D

Sodium Bicarbonate Neutralizes, W77-03570 5D

Sludge Drying Beds are Practical: Part 2, W77-03572 5D

Aeration and Oxygen Transfer in Biological Reactors, W77-03575 5D

Flotation for Water and Wastewater Treatment, W77-03576 5D

TREES

Experimental Ecology of Selected Vertebrate Species, W77-03564 6G

TRENCHLESS SEWERS

Innovations in Sewer Design and Construction, W77-03399 8G

TRIBUTARIES

Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices, W77-03351 5A

TRICKLING FILTERS

Technical Assistance Project Greeley Wastewater Treatment Facility, Greeley, Colorado. June-July, 1972, W77-03368 5D

TRICKLING FILTERS

Advanced Trickling Filter for Wastewater Treatment, W77-03365 5D

TRINITROTOLUENE (TNT)

Aquatic Field Survey at Iowa Army Ammunition Plant, W77-03386 5C

SUBJECT INDEX

VIRGINIA

TROPHIC LEVEL

Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin,
W77-03077 5C

Coastal Region Residence Time Estimates from Concentration Gradients,
W77-03093 5C

Lake Phosphorus Loading Graphs: An Alternative,
W77-03377 5C

TROUT

Reproduction by Adfluvial Salmonids in Spawn Creek, Cache County, Utah,
W77-03160 2I

TSUNAMIS

Seismic and Volcanic Risk Studies - Western Gulf of Alaska,
W77-03260 2L

TUNNELLING

Mechanical Mole Burrows Sewer Tunnel,
W77-03397 8C

TUNNELLING MACHINES

Mechanical Mole Burrows Sewer Tunnel,
W77-03397 8C

TURBIDITY

Measurement of 'Turbidity' and Related Characteristics of Natural Waters,
W77-03339 7B

TUSCARAWAS RIVER (OH)

Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio.
W77-03174 4A

ULTRAVIOLET DISINFECTION

Ultraviolet Disinfection: An Alternative to Chlorination,
W77-03445 5D

ULTRAVIOLET RADIATION

Ultraviolet Disinfection: An Alternative to Chlorination,
W77-03445 5D

Ultraviolet Purification System.
W77-03467 5A

UNDRAINED PORE PRESSURES

Undrained Behavior of Embankments on New Liskeard Varved Clay,
W77-03108 8D

UNIONS

Unions Fight a Jones Act Waiver.
W77-03532 6E

UNIT HYDROGRAPHS

The Unit Hydrograph: A Satisfactory Model of Watershed Response,
W77-03126 4D

UNITED KINGDOM

Normal-Mode Analysis of the Structure of Baseflow Recession Curves,
W77-03313 2F

UNITED NATIONS

A Sweeping Sea Law in 1976.
W77-03533 6E

Coming Showdown: Ocean Nationalism and the Senate 200-Mile Shelf Bill,
W77-03591 6E

UNITED STATES

National Program for Managing Flood Losses: Guidelines for Preparation, Transmittal, and Distribution of Flood-Prone Area Maps and Pamphlets,
W77-03341 7C

Unions Fight a Jones Act Waiver.
W77-03532 6E

UNIVERSITIES

Annual Report, 1975-1976, (Hawaii Water Resources Research Center),
W77-03165 9D

UPWELLING

Mesoscale Currents and Water Masses in the Gulf of Alaska,
W77-03236 5B

URBAN CHANNELS

The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England,
W77-03314 4C

URBAN HYDROLOGY

The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England,
W77-03314 4C

URBAN RUNOFF

Relation Between Atmospheric Pollution, Precipitation, and Streamwater Quality Near A Large Urban-Industrial Complex,
W77-03097 5B

URBANIZATION

The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England,
W77-03314 4C

USSR

Earth and Rock-Fill Dams: Basis of Their Design and Construction, Second Edition,
W77-03102 8D

Factors of Soil Salinization During Irrigation in the Turan Lowland, (In Russian),
W77-03124 2G

Artificial Modification of Atmospheric Processes,
W77-03303 3B

Significance of Nitrates in Drinking Water, (In Russian),
W77-03541 5B

Precipitation on the Aral Sea Surface, (In Russian),
W77-03592 2B

USSR (VOROSHILOVGRAD)

Sanitary-Bacteriological Study of the Effectiveness of Decontaminating the Sewage of Voroshilovgrad on Sewage Farms, (In Russian),
W77-03128 5D

UTAH

Reproduction by Adfluvial Salmonids in Spawn Creek, Cache County, Utah,
W77-03160 2I

Hydrologic Studies by the U.S. Geological Survey in Oil-Shale Areas of Colorado, Utah, and Wyoming, 1976.
W77-03340 4B

General Basis of Water Rights in Utah.
W77-03504 6E

Flood Control Projects and Drought Emergencies.
W77-03505 6E

Water, Lighting and Sewers.
W77-03506 6E

Head Gates; Powers of State Engineer.
W77-03507 6E

Suspension and Restoration of Right to Appropriate.
W77-03508 6E

Irrigation Districts.
W77-03509 6E

Hydrologic Inventory of the San Rafael Study Unit.
W77-03552 4A

The State of Utah Water - 1975,
W77-03559 6B

The State of Utah Water.
W77-03560 6D

UTAH WATER PLAN

The State of Utah Water - 1975,
W77-03559 6B

VALPARAISO BAY (CHILE)

Phytoplankton Ecology in Valparaiso Bay: III. Phytoplankton from 1972-73, (In Spanish),
W77-03200 5C

VARIABILITY

Aspects of the Chemical Variability of some Tasmanian Inland Waters (Australia),
W77-03283 2K

VARIETIES

Environmental Status of the Lake Michigan Region. Vol. 17. Inland Fishes of the Lake Michigan Drainage Basin,
W77-03566 6G

VARVES

Undrained Behavior of Embankments on New Liskeard Varved Clay,
W77-03108 8D

VEGETABLE CROPS

Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois,
W77-03565 5A

VICTORIA

Stability of Ionic Proportions in Five Salt Lakes in Victoria, Australia,
W77-03285 2H

VIRGIN ISLANDS (BRITISH)

Sewage Plant for British Virgin Islands.
W77-03437 5D

VIRGINIA

Measured and Simulated Ground-Water Levels in the Franklin Area, Southeastern Virginia,
W77-03326 7C

Assateague Ecological Studies.
W77-03381 5C

Virginia State Program for Control of Discharge of Pollutants to Navigable Waters; Approval.
W77-03527 5G

SUBJECT INDEX

VIRUS REMOVAL

VIRUS REMOVAL

The Application of the Foam Fractionation Process to the Removal of Viruses. Part I. The Production of a Mathematical Model to Predict the Efficiency of Virus Removal, W77-03433 5D

Virus and Bacterial Removal from Waste Water by Land Treatment, W77-03447 5D

VIRUSES

Field Monitoring Techniques and Data Analysis, W77-03150 5A

The Application of the Foam Fractionation Process to the Removal of Viruses. Part I. The Production of a Mathematical Model to Predict the Efficiency of Virus Removal, W77-03433 5D

Virus and Bacterial Removal from Waste Water by Land Treatment, W77-03447 5D

Heat Inactivation of Poliovirus in Waste Water Sludge, W77-03448 5C

Cyanophage Analysis as a Biological Pollution Indicator-Bacterial and Viral, W77-03460 5A

VISCOUS FLOW

Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A

A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03151 4A

VOLCANOES

Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

WA

Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968 - January 1975, W77-03343 5A

WABASH RIVER BASIN

A Preliminary Study of the Taste and Odor Problems in Grand Lake, Ohio and the Wabash Rivers, Indiana, W77-03384 5C

WAIVERS

Unions Fight a Jones Act Waiver. W77-03532 6E

WARE RIVER (MA)

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts. W77-03178 4A

WASHINGTON

A Computer Program for Estimating Costs of Owning and Operating an Irrigation Well Under Conditions of Declining Water Levels, W77-03211 6C

A Study of the Suspended Particulate Problem in the Duwamish Basin, W77-03291 5A

Low Flow Modeling in Small Steep Watersheds, W77-03316 4D

Data on Selected Lakes in Washington, Part 5, W77-03350 7C

Effect of Added Salts on Nitrogen Released and Nitrate Levels in Forest Soils of the Washington Coastal Area, W77-03396 2G

Clippinger V Birge (Riparian Rights in an Artificial Lake). W77-03512 6E

1971 Shoreline Management Act. W77-03514 6E

Irrigation Districts Powers and Purposes. W77-03515 6E

Waterway Districts. W77-03516 6E

Eminent Domain. W77-03517 6E

WASHOVER DEPOSITS

Nature and Genesis of Some Storm Washover Deposits, W77-03293 2L

WASTE DISPOSAL

Residual Waste Management Research and Planning Projects, September 1975, W77-03355 5B

Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography. W77-03358 5B

Ship-to-Shore Sewage Hose Handling Tests, W77-03364 5D

WASTE TREATMENT

Ship-to-Shore Sewage Hose Handling Tests, W77-03364 5D

Concentric Waste-Treatment Plant Saves Land, Cuts Cost, W77-03427 5D

Fermentation of Waste Materials to Produce Industrial Intermediates, W77-03563 5D

WASTE WATER (POLLUTION)

Water Usage and Wastewater Characterization at a Crops of Engineers Recreation Area, W77-03362 5A

Report on Pollution in Las Vegas Wash and Las Vegas Bay. W77-03371 5C

Factors Affecting Powdered Carbon Treatment of a Municipal Wastewater, W77-03430 5D

WASTE WATER TREATMENT

An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D

Treatment of Livestock Wastes by a Barriered Landscape Water Renovation System, W77-03116 5D

Characterization and Dewaterability of Water Treatment Plant Residues, W77-03130 5D

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides, W77-03132 5D

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

The Kinetics of Adsorption of Phenols by Granular Activated Carbon, W77-03149 5D

Dynamic Response of Final Settling Tanks to Transient Loading Conditions, W77-03156 5D

Behavior of Ground Water Subject to Irrigation of Effluent - A Case Study, W77-03158 5D

A Study on the Application of Biogrowth Sheets to Improve Lagoon Effluent Quality, W77-03162 5D

Liming Farmland with Calcium Sludge, W77-03163 5D

The Rotating Biological Filter, W77-03282 5D

Land Based Sewage Sludge Management Alternatives for Los Angeles: Evaluation and Comparison, W77-03289 5D

System for Dewatering Dilute Slurries, W77-03352 5D

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D

Research Needs for the Potable Reuse of Municipal Wastewater, W77-03356 5D

Chlorine Disinfection of Treated Wastewater in a Baffled Contact Chamber at Less Than 1 C, W77-03363 5D

Advanced Trickling Filter for Wastewater Treatment, W77-03365 5D

Ammonia Removal from Wastewater by Ligand Exchange, W77-03367 5D

Technical Assistance Project Greeley Wastewater Treatment Facility, Greeley, Colorado. June-July, 1972, W77-03368 5D

Decontamination of Water Contaminated with Polycyclic Aromatic Hydrocarbons (PAH). I. Action of Chlorine and Ozone on PAH Dissolved in Doubly Distilled and in De-ionized Water, W77-03369 5D

Activated Sludge Waste Water Treatment Process - Using Succession of Aerobic and Anaerobic Zones to Remove Nitrogenous Material. W77-03402 5D

Screening Apparatus for Removal of Solids - From Sewage with Rotating Screen and Vertical Lift for Residues. W77-03403 5D

SUBJECT INDEX

WASTE WATER TREATMENT

Biological Treatment of Sewage Waters -
Device with Internal Aeration Zone,
W77-03404 5D

Sludge Collector and Light Liquid Separator-
From Sewage with Two Tanks in Single Hous-
ing and Cover.
W77-03405 5D

Sewerage Treatment Apparatus,
W77-03406 5D

Coagulation Clarifying Effluents Contaminated
with Colloid Suspensions-By Electrophoresis
After Mixing in Insoluble Metallic Particles.
W77-03408 5D

Centrifuge for Dewatering Sewage Sludge.
W77-03410 5D

Integral Circular Wastewater Treatment Plant.
W77-03411 5D

Denver's Headworks Reflects Complexity of
System,
W77-03412 5D

Combined Process of Pyrolysis and Com-
bustion for Sludge Disposal,
W77-03415 5D

Dorr-Oliver to Market Ecolotrol Waste Water
Treatment Process.
W77-03417 5D

High Gradient Magnetic Filtration,
W77-03418 5D

Waste-Treatment 'Farm' Harvests Firms.
W77-03420 5D

Use of Sludge Left After Waste Water Decan-
tation as a Fertilizer or Soil Conditioner (Les
Boues de Decantation d Eau Residuares
Utilisees Comme Fertilisant ou Comme Condi-
tionneur de Sols),
W77-03421 5D

Specific Role of Lime in Municipal Waste
Water Treatment-Expectations and Reality (Die
Spezifische Rolle Des Kalks in Der Kommu-
nalen Abwasserreinigung-Erwartungen Und
Realitaeten),
W77-03422 5D

Origin of Nitrogen Pollution in Surface and
Waste Waters (Origines Des Pollutions Azotees
Dans Les Eaux Superficielles Et Les Eaux
Usees),
W77-03423 5D

Sludge - Where Will We Put It,
W77-03424 5E

Activated Carbon From Activated Sludge,
W77-03425 5D

Design and Control of Nitrifying Activated
Sludge Systems,
W77-03426 5D

Concentric Waste-Treatment Plant Saves Land,
Cuts Cost,
W77-03427 5D

The Rotor Aerator: Growing Use In U.S.
Waste-Treatment Plants.
W77-03428 5D

Elemental Distribution Diagrams for Biological
Wastewater Treatment,
W77-03429 5D

Factors Affecting Powdered Carbon Treatment
of a Municipal Wastewater,
W77-03430 5D

U. S. Air Force Greens Colorado.
W77-03431 5D

Shelters Boost Winter Treatment Efficiencies,
W77-03432 5D

The Application of the Foam Fractionation
Process to the Removal of Viruses. Part I. The
Production of a Mathematical Model to Predict
the Efficiency of Virus Removal,
W77-03433 5D

Effluent Variability Estimation for Complete-
Mix Activated Sludge Treatment Systems,
W77-03434 5D

Behaviour in Conventional Sewage Purification
Processes of Coliform Bacteria with Transfera-
ble or Non-Transferable Drug-Resistance,
W77-03435 5D

Correlation Between BOD - TOC - TOD
(Zusammenhang Zwischen BSE5 - TOC -
TOD),
W77-03436 5D

Sewage Plant for British Virgin Islands.
W77-03437 5D

Small Village Gets Advanced Treatment.
W77-03440 5D

Biochemical Mechanisms in the Methane Fer-
mentation of Glutamic and Oleic Acids,
W77-03441 5D

Large Scale Sewage Treatment Plant with
Sludge Incinerator.
W77-03442 5D

Comparison of Air and Oxygen Activated
Sludge Systems,
W77-03443 5D

Oxygen and Air Activated Sludge: Another
View,
W77-03444 5D

Ultraviolet Disinfection: An Alternative to
Chlorination,
W77-03445 5D

Flow Equalization by Use of Aeration Tank
Volume,
W77-03446 5D

Virus and Bacterial Removal from Waste
Water by Land Treatment,
W77-03447 5D

Heat Inactivation of Poliovirus in Waste Water
Sludge,
W77-03448 5C

An Operator's Approach to Aerobic Digester
Supernatant Disposal Problems,
W77-03449 5D

Supernatant Decanting of Aerobically Digested
Waste Activated Sludge,
W77-03450 5D

Intermittent Sand Filtration of Household
Wastewater,
W77-03452 5D

Tertiary Treatment of Sewage Effluents,
W77-03453 5D

Minimizing the Waste Discharges from Water
Treatment Plants,
W77-03455 5D

Laboratory Studies on the Effects of Tempera-
ture on Accumulation of Solids in Biological
Filters,
W77-03464 5D

Nitrate Monitoring.
W77-03468 5A

Automation: A Short History, But a Long Fu-
ture,
W77-03469 5D

The Limitation of the Ratio of Fecal Coliforms
to Total Coliphage as a Water Pollution Index,
W77-03472 5A

Effect of Variable Loading on Oxygen Uptake,
W77-03473 5D

Transferable Drug Resistance Associated with
Coliforms Isolated from Hospital and Domestic
Sewage,
W77-03478 5A

Infiltration/Inflow - The Kansas Connection,
W77-03479 5G

A Study of Substrate Removal in a Microbial
Film Reactor,
W77-03480 5D

Innovation is an Old Idea--With A Big Future,
W77-03482 5D

Grant Aid for Plant Operations: An Evaluation,
W77-03483 5G

Risk of Communicable Disease Infection As-
sociated with Waste Water Irrigation in
Agricultural Settlements,
W77-03485 5C

Removal of BOD and Nitrogenous Pollutants
from Wastewaters,
W77-03486 5D

Comparative Assessment of the Effectiveness
of Certain Methods Making Industrial Effluents
Noncarcinogenic, (In Russian),
W77-03488 5D

Paint Formulating Point Source Category Ef-
fluent Guidelines and Standards.
W77-03526 5G

Organic Chemicals Manufacturing Point Source
Category-Effluent Limitations and Guidelines
(Amendments to Regulations-Butadiene).
W77-03528 5G

Variations of Coliform Bacteria and Other Pol-
lution Indices in Surface Waters.
W77-03539 5B

The Cost of Producing Effluents to Varying
Standards by Biological Treatment Techniques,
W77-03568 5D

Recent Developments in the Use of Polyelec-
trolytes,
W77-03569 5D

Sodium Bicarbonate Neutralizes,
W77-03570 5D

Effect of High Dissolved Oxygen Concentra-
tion in Activated Sludge Systems,
W77-03571 5D

Sludge Drying Beds are Practical: Part 2,
W77-03572 5D

SUBJECT INDEX

WASTE WATER TREATMENT

- Inhibiting Nitrification in Wastewater Treatment Plants, W77-03573 5D
- Experiments on Wastewater Sedimentation, W77-03574 5D
- Aeration and Oxygen Transfer in Biological Reactors, W77-03575 5D
- Flotation for Water and Wastewater Treatment, W77-03576 5D
- Wastewater's Future is Cloudy, W77-03577 5D
- Oxygen Transfer in a 23-Meter Bubble Column, W77-03579 5D
- An Economic Evaluation of Deep Tank Aeration for Wastewater Treatment, W77-03580 5D
- WATER ALLOCATION (POLICY)**
- Control of Water and Eminent Domain, W77-03503 6E
- General Basis of Water Rights in Utah, W77-03504 6E
- Useful Modeling Concepts for the FCD Water System, W77-03524 6A
- Water Management and Regulation of Water Use, W77-03525 6B
- Meeting Water Demands in Sacramento County, W77-03553 6D
- The State of Utah Water - 1975, W77-03559 6B
- The State of Utah Water, W77-03560 6D
- WATER ANALYSIS**
- Microbiological Examination of Waters and Effluents, W77-03470 5A
- Nature Preservation Activity RR Investigation: Part 6. A Modified Method of Measuring the Chemical Oxygen Demand Gives a High Analytical Capacity, (In Swedish), W77-03589 5A
- WATER BALANCE**
- Precipitation on the Aral Sea Surface, (In Russian), W77-03592 2B
- WATER CHEMISTRY**
- The Composition of Rainwater at Two Sites Near Townsville, Qld. (Australia), W77-03279 2K
- Aspects of the Chemical Variability of some Tasmanian Inland Waters (Australia), W77-03283 2K
- Chemistry of Salt Lakes and Other Waters in the Sub-Humid Regions of Tasmania (Australia), W77-03284 2H
- Secondary Treatment Information; Biochemical Oxygen Demand, Suspended Solids and pH, W77-03530 5G

- WATER CIRCULATION**
- Flow Dynamics of the Neuse River Estuary, W77-03300 2L
- WATER CONTROL**
- Control of Water and Eminent Domain, W77-03503 6E
- WATER COOLING**
- Distribution and Feeding of Pumpkinseed (*Lepomis gibbosus*) and Black Crappie (*Pomoxis nigromaculatus*) in a power plant cooling lake, W77-03078 5C
- WATER DEMAND**
- Projections of Population, Employment, Income and Water Use for Iowa River Basins, 1975-2020, W77-03542 6D
- Meeting Water Demands in Sacramento County, W77-03553 6D
- Vegetative Water Use in California, 1974, W77-03554 3F
- WATER DISTRIBUTION (APPLIED)**
- Irrigation and Water Rights, W77-03502 6E
- Irrigation Districts Powers and Purposes, W77-03515 6E
- The California State Water Project in 1975, W77-03551 6B
- WATER DISTRICTS**
- Irrigation Districts, W77-03509 6E
- WATER LEVEL FLUCTUATIONS**
- Wind-Induced Water Level Oscillations in Shallow Lagoons, W77-03287 2H
- Ground-Water Levels in New Mexico, 1975, W77-03330 7C
- WATER LEVELS**
- Measured and Simulated Ground-Water Levels in the Franklin Area, Southeastern Virginia, W77-03326 7C
- Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico-1975, W77-03327 7C
- Maps Showing Ground-Water Conditions in the San Bernardino Valley Area Cochise County, Arizona-1975, W77-03328 7C
- WATER LOSS**
- Changes in the Transpiration Rate and Leaf Water Content in Several Varieties of *Cryptomeria Japonica* Subjected to Water Stress, (In Japanese), W77-03155 2D
- WATER MANAGEMENT (APPLIED)**
- Water Usage and Wastewater Characterization at a Crops of Engineers Recreation Area, W77-03362 5A
- Irrigation Districts, W77-03509 6E

- Eutrophication and Restoration of Lakes Receiving Nutrients from Diffuse Sources Only, W77-03536 5C
- The Objectives, Part I of the State Water Plan, (Idaho Water Resources Board), W77-03544 6B
- Water for Nevada. Water Planning Report, W77-03545 6B
- The California State Water Project in 1975, W77-03551 6B
- Hydrologic Inventory of the San Rafael Study Unit, W77-03552 4A
- Meeting Water Demands in Sacramento County, W77-03553 6D
- Iowa Water Resources Framework Study Plan of Study, W77-03561 6B
- WATER MEASUREMENT**
- Head Gates; Powers of State Engineer, W77-03507 6E
- WATER PERMITS**
- Water Management and Regulation of Water Use, W77-03525 6B
- Implementing the National Water Pollution Control Permit Program: Progress and Problems, W77-03588 5G
- WATER POLICY**
- Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I, W77-03288 6E
- National Safe Drinking Water Strategy, One Step at a Time, W77-03357 5G
- WATER POLLUTION**
- Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment, W77-03188 5B
- Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A
- Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C
- Microbial Release of Soluble Trace Metals from Oil Impacted Sediments, W77-03225 5C
- Current Measurements in the Beaufort Sea, W77-03228 2L
- Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas, W77-03229 5C
- Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

SUBJECT INDEX

WATER POLLUTION SOURCES

Numerical Studies of Alaskan Region,
W77-03231 5B

Bristol Bay Oceanographic Processes (B-BOP),
W77-03232 5B

STD Mappings of the Beaufort Sea Shelf,
W77-03233 2L

Preparation of Hydrodynamical-Numerical and
3-Parameter Small-Mesh Atmospheric Models
for Coastal Waters in the Gulf of Alaska,
W77-03235 5B

Mesoscale Currents and Water Masses in the
Gulf of Alaska,
W77-03236 5B

Transport of Pollutants in the Vicinity of Prud-
hoe Bay, Alaska,
W77-03238 5B

Near-Shore Atmospheric Modification,
W77-03242 5B

Coastal Morphology and Sedimentation, Gulf
Coast of Alaska (Glacial Sedimentation),
W77-03244 5B

The Environmental Geology and Geomorphology
of the Gulf of Alaska Coastal Plain,
W77-03246 2L

Distribution, Composition and Transport of
Suspended Particulate Matter in the Gulf of
Alaska and Southeastern Bering Shelf,
W77-03248 2L

Offshore Permafrost Studies, Beaufort Sea,
W77-03249 2L

Distribution and Character of Icings in
Northeastern Alaska,
W77-03252 2C

A 'Herring-Bone' Pattern of Possible Taylor-
Gortler-Type Flow Origin Seen in Sonographs,
W77-03253 5B

Seismic and Volcanic Risk Studies - Western
Gulf of Alaska,
W77-03260 2L

Offshore Permafrost-Drilling, Boundary Condi-
tions, Properties, Processes and Models,
W77-03261 5B

Beaufort Seacoast Permafrost Studies,
W77-03262 2C

Faulting and Instability of Shelf Sediments -
Western Gulf of Alaska,
W77-03264 2L

The Interaction of Oil with Sea Ice in the Arctic
Ocean,
W77-03267 5C

Operation of an Alaskan Facility for Applica-
tions of Remote-Sensing Data to OCS Studies,
W77-03277 7B

Residual Waste Management Research and
Planning Projects, September 1975,
W77-03355 5B

Assessment of Offshore Dumping in the New
York Bight, Technical Background: Physical
Oceanography, Geological Oceanography, and
Chemical Oceanography.
W77-03358 5B

Preliminary Assessment of Suspected Car-
cinogens in Drinking Water: Report to Con-
gress.
W77-03360 5A

The Impact of Fargo, North Dakota's Waste
Discharges on the Interstate Waters of the Red
River of the North, September 1969-April 1970,
W77-03361 5B

Mussel Test for Biological Control of Water
Pollution (Kagyo-teszt vizsennyezések
biológiai hatástanak vizsgálata),
W77-03454 5A

Marine Sanitation Device Standard.
W77-03531 5G

Unions Fight a Jones Act Waiver.
W77-03532 6E

The Impact of Intensive Application of Pesti-
cides and Fertilizers on Underground Water
Recharge Areas which May Contribute to
Drinking Water Problems,
W77-03567 5B

WATER POLLUTION CONTROL

National Safe Drinking Water Strategy, One
Step at a Time.
W77-03357 5G

Colorado Water Quality Control Act.
W77-03490 6E

Village of Lombard V State Pollution Control
Board (Pollution Control Board Without
Authority to Impose Regionalization Upon
Local Governmental Bodies).
W77-03511 6E

Virginia State Program for Control of
Discharge of Pollutants to Navigable Waters;
Approval.
W77-03527 5G

The Hard Job of Saving Lake Erie.
W77-03534 5G

The Muddy Road to Clean Water,
W77-03587 5G

Implementing the National Water Pollution
Control Permit Program: Progress and
Problems.
W77-03588 5G

WATER POLLUTION EFFECTS

Coastal Region Residence Time Estimates from
Concentration Gradients,
W77-03093 5C

Toxicity of No. 2 Fuel Oil to Coon Stripe
Shrimp,
W77-03186 5C

Effects of Oil Pollution on Breeding Grey
Seals,
W77-03187 5C

Effects of Crude Oil on American Lobster
(Homarus Americanus) Larvae in the Labora-
tory,
W77-03197 5C

Effects on Fertilization and Development of
the Common Mussel, Mytilus Edulis After
Long-Term Exposure to a Nonionic Surfactant,
W77-03198 5C

Effect of Copper on Some Aspects of the
Bioenergetics of Rainbow Trout (Salmo gaird-
neri),
W77-03203 5C

Effects of Chronic DDT/DDE Exposure on
Anesthetic Induction and Recovery Times in
Rainbow Trout (Salmo Gairdneri),
W77-03204 5C

Assessment of Potential Interactions of
Microorganisms and Pollutants Resulting from
Petroleum Development on the Outer Conti-
nental Shelf in the Beaufort Sea,
W77-03217 5C

Distribution of Light Hydrocarbons, C1-C14, in
the Northeast Gulf of Alaska and the
Southeastern Bering Shelf,
W77-03221 5B

Hydrocarbons: Natural Distribution and
Dynamics on the Alaskan Outer Continental
Shelf,
W77-03224 5B

Historical and Statistical Oceanographic Data
Analysis and Ship of Opportunity Program,
W77-03237 5A

Benthos-Sedimentary Substrate Interactions,
W77-03263 5C

Preliminary Assessment of Suspected Car-
cinogens in Drinking Water: Report to Con-
gress.
W77-03360 5A

The Impact of Fargo, North Dakota's Waste
Discharges on the Interstate Waters of the Red
River of the North, September 1969-April 1970,
W77-03361 5B

WATER POLLUTION SOURCES

Immediate Industrial Effects on Sediment Mer-
cury Concentrations in a Clean Coastal En-
vironment,
W77-03188 5B

Olympic Alliance Oil Spillage,
W77-03195 5C

Hydrocarbons: Natural Distribution and
Dynamics on the Alaskan Outer Continental
Shelf,
W77-03224 5B

Development and Operation of HF Current-
Mapping Radar Units-Physical Oceanography,
W77-03227 5B

Outer Continental Shelf Energy Program,
W77-03234 5B

Report on Pollution in Las Vegas Wash and
Las Vegas Bay.
W77-03371 5C

Evaluation of Lake Milner Water Quality
Model,
W77-03373 5B

Water Quality in the Calumet Area. Conference
on Pollution of Lower Lake Michigan, Calumet
River, Grand Calumet River, Little Calumet
River, and Wolf Lake, Illinois and Indiana.
W77-03382 5B

Paint Formulating Point Source Category Ef-
fluent Guidelines and Standards.
W77-03526 5G

The Wyoming Water Quality Act and the
Federal Water Pollution Control Act Amend-
ments of 1972: A Comparison,
W77-03600 5G

SUBJECT INDEX

WATER PURIFICATION

WATER PURIFICATION

Specific Role of Lime in Municipal Waste Water Treatment Expectations and Reality (Die Spezifische Rolle Des Kalks in Der Kommunalen Abwasserreinigung-Erwartungen Und Realitaeten), W77-03422 5D

Nature Preservation Activity RR Investigation: Part 6. A Modified Method of Measuring the Chemical Oxygen Demand Gives a High Analytical Capacity, (In Swedish), W77-03589 5A

WATER QUALITY

Surf-Zone Water Quality in Liverpool Bay, W77-03092 5B

Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota, W77-03094 5C

Environmental Impact of Land Use on Water Quality. Progress Report, W77-03106 5G

The Relationship of Bottom Sediments to Bacterial Water Quality in a Recreational Swimming Area, W77-03167 5B

Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons, W77-03219 5A

Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B

Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas, W77-03222 5B

Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea, W77-03226 5B

Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography, W77-03227 5B

Bear River Evaluation Report, 1974 Survey, W77-03292 5B

Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A

Allatoona Lake, Destratification Equipment Test Report, W77-03306 5G

Allatoona Lake, Destratification Equipment Test, Appendix A, Operational and Water Quality Data, 1968. W77-03307 5G

Allatoona Lake, Destratification Equipment Test, Appendix B, Operational and Water Quality Data, 1969. W77-03308 5G

Allatoona Lake, Destratification Equipment Test, Appendix C, Operational and Water Quality Data, 1970. W77-03309 5G

Allatoona Lake, Destratification Equipment Test, Appendix D, Effects of Artificial Destratification on Temperature and Dissolved Oxygen in Allatoona Reservoir. W77-03310 5G

Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico--1975, W77-03327 7C

Maps Showing Ground-Water Conditions in the San Bernardino Valley Area Cochise County, Arizona--1975, W77-03328 7C

Ground-Water Quality Data for Georgia, W77-03333 7C

Buried Aquifers in the Brooten-Belgrade and Lake Emily Areas, West-Central Minnesota--Factors Related to Developing Water for Irrigation, W77-03335 4B

Appraisal of Water Resources in the Hackensack River Basin, New Jersey, W77-03336 2F

Hydrologic Studies by the U.S. Geological Survey in Oil-Shale Areas of Colorado, Utah, and Wyoming, 1976. W77-03340 4B

Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968 - January 1975, W77-03343 5A

Summary of Geology and Ground-Water Resources of Passaic County, New Jersey, W77-03345 4B

Ground-Water Resources of Greeley and Wichita Counties, Western Kansas, W77-03347 4B

Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California, W77-03348 7C

Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices, W77-03351 5A

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D

Water Pollution Surveillance in the United States. Report Number 1, Missouri River Main Stem, 1958-1962. W77-03379 5A

Groundwater Quality Adjacent to a Septic Tank System, W77-03456 5D

Monitoring of Community Water Supplies, W77-03463 5A

Colorado Water Quality Control Act. W77-03490 6E

Water Quality, Plankton and Eutrophication of Bergvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian), W77-03595 5C

WATER QUALITY ACT

The Muddy Road to Clean Water, W77-03587 5G

The Wyoming Water Quality Act and the Federal Water Pollution Control Act Amendments of 1972: A Comparison, W77-03600 5G

WATER QUALITY STANDARDS

Suitability of Lagoon Effluents for Irrigation in South Dakota, W77-03152 5D

Bear River Evaluation Report, 1974 Survey, W77-03292 5B

National Safe Drinking Water Strategy, One Step at a Time. W77-03357 5G

Delaware 1975 State Water Quality Inventory, W77-03378 5G

Water Quality in the Calumet Area. Conference on Pollution of Lower Lake Michigan, Calumet River, Grand Calumet River, Little Calumet River, and Wolf Lake, Illinois and Indiana. W77-03382 5B

Microbiological Examination of Waters and Effluents, W77-03470 5A

Water Pollution. W77-03495 6E

Secondary Treatment Information; Biochemical Oxygen Demand, Suspended Solids and pH. W77-03530 5G

Experimental Substantiation of the Maximal Permissible Concentrations of Triethanolamine, Ammonium and Calcium Salts of Alkylbenzosulfates in Water Bodies, (In Russian), W77-03586 5B

Implementing the National Water Pollution Control Permit Program: Progress and Problems. W77-03588 5G

WATER REQUIREMENTS

Water Resources of Australia and the Pattern of Population Concentrations, W77-03278 6D

Water Usage and Wastewater Characterization at a Crops of Engineers Recreation Area, W77-03362 5A

WATER RESOURCES

Water Resources of Australia and the Pattern of Population Concentrations, W77-03278 6D

Hydrologic Studies by the U.S. Geological Survey in Oil-Shale Areas of Colorado, Utah, and Wyoming, 1976. W77-03340 4B

Use of Hybrid Computer Model in Resource Planning, W77-03523 6A

SUBJECT INDEX

WATER WELLS

WATER RESOURCES DEVELOPMENT

Hydrologic Engineering Methods for Water Resources Development, Volume 6, Water Surface Profiles, W77-03105 8B

Great Lakes Compact Commission. W77-03513 6E

Iowa's Water Resources Program Progress and Needs. W77-03547 6B

The California State Water Project in 1975. W77-03551 6B

The State of Utah Water. W77-03560 6D

Iowa Water Resources Framework Study Plan of Study. W77-03561 6B

Coming Showdown: Ocean Nationalism and the Senate 200-Mile Shelf Bill, W77-03591 6E

WATER RESOURCES DEVELOPMENT ACT

Corps' New Look in Flood Control: No Dams, Levees, W77-03593 4A

WATER RESOURCES INSTITUTE

Publications List of the Idaho Water Resources Research Institute, W77-03154 10C

Annual Report, 1975-1976, (Hawaii Water Resources Research Center), W77-03165 9D

WATER RESOURCES RESEARCH ACT

Report on Tenth Annual Water Resources Research Conference, Sponsored by Office of Water Research and Technology, April 9-10, 1975. W77-03206 9D

WATER REUSE

Sanitary-Bacteriological Study of the Effectiveness of Decontaminating the Sewage of Voroshilovgrad on Sewage Farms, (In Russian), W77-03128 5D

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

Suitability of Lagoon Effluents for Irrigation in South Dakota, W77-03152 5D

Behavior of Ground Water Subject to Irrigation of Effluent - A Case Study, W77-03158 5D

Research Needs for the Potable Reuse of Municipal Wastewater, W77-03356 5D

Waste-Treatment 'Farm' Harvests Firms. W77-03420 5D

U. S. Air Force Greens Colorado. W77-03431 5D

Innovation is an Old Idea--With A Big Future, W77-03482 5D

Wastewater's Future is Cloudy, W77-03577 5D

Keep Cool with Sewage Effluent - A Two-Way Saving of Water, W77-03578 3E

WATER RIGHTS

Rights to Water. W77-03494 6E

Water Rights and Liens. W77-03499 6E

Ditch Companies. W77-03501 6E

Irrigation and Water Rights. W77-03502 6E

General Basis of Water Rights in Utah. W77-03504 6E

Water, Lighting and Sewers. W77-03506 6E

Water Rights, W77-03599 6E

WATER RIGHTS (NON-RIPARIAN)

Rights to Water. W77-03494 6E

A Sweeping Sea Law in 1976. W77-03533 6E

WATER SUPPLY

The Occurrence of Groundwater in the Satpura Region of Central India, W77-03146 4B

Precautions to be Taken in the Construction and Maintenance of Water Supply and Sewer Systems (Precautions a Prendre Dans La Construction Et L'Entretien Des Reseaux D' Aqueduc Et D' Egout), W77-03400 8G

Monitoring of Community Water Supplies, W77-03463 5A

Water, Lighting and Sewers. W77-03506 6E

Suspension and Restoration of Right to Appropriate. W77-03508 6E

WATER SURFACE PROFILES

Hydrologic Engineering Methods for Water Resources Development, Volume 6, Water Surface Profiles, W77-03105 8B

WATER TABLE

Behavior of Ground Water Subject to Irrigation of Effluent - A Case Study, W77-03158 5D

WATER TEMPERATURE

Effect of Temperature and Salinity on Extension of Siphons by Mercenaria Mercenaria, W77-03205 5C

Allatoona Lake, Destratification Equipment Test, Appendix D, Effects of Artificial Destratification on Temperature and Dissolved Oxygen in Allatoona Reservoir. W77-03310 5G

WATER TREATMENT

Decontamination of Water Contaminated with Polycyclic Aromatic Hydrocarbons (PAH). I. Action of Chlorine and Ozone on PAH Dissolved in Doubly Distilled and in De-Ionized Water, W77-03369 5D

'Give Flotation a Try' was Challenged.

W77-03439 5F

Effect of Water Chlorination Upon Levels of Some Polynuclear Aromatic Hydrocarbons in Water, W77-03459 5F

Investigations on the Importance of the Organic Chloro-Compounds and their Adsorbability (Untersuchungen Zur Bedeutung der Organischen Chlorverbindungen und Ihrer Adsorbierbarkeit), W77-03465 5A

Innovation is an Old Idea--With A Big Future, W77-03482 5D

Flotation for Water and Wastewater Treatment, W77-03576 5D

Nature Preservation Activity RR Investigation: Part 6. A Modified Method of Measuring the Chemical Oxygen Demand Gives a High Analytical Capacity, (In Swedish), W77-03589 5A

WATER USERS

Rights to Water. W77-03494 6E

WATER UTILIZATION

Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions, W77-03142 2D

Ground-Water Levels in New Mexico, 1975, W77-03330 7C

Water Usage and Wastewater Characterization at a Crops of Engineers Recreation Area, W77-03362 5A

Suspension and Restoration of Right to Appropriate. W77-03508 6E

Urban Water Use in California. W77-03549 6B

WATER WAVE MODELS

Landslide Generated Water Wave Model, W77-03318 8B

WATER WELLS

Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico--1975, W77-03327 7C

Maps Showing Ground-Water Conditions in the San Bernardino Valley Area Cochise County, Arizona--1975, W77-03328 7C

Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California. W77-03342 2K

Ground-Water Resources of Greeley and Wichita Counties, Western Kansas, W77-03347 4B

Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California, W77-03348 7C

SUBJECT INDEX

WATER WELLS

- Significance of Nitrates in Drinking Water, (In Russian),
W77-03541 5B

WATER YIELD

- Buried Aquifers in the Brooten-Belgrade and Lake Emily Areas, West-Central Minnesota--Factors Related to Developing Water for Irrigation,
W77-03335 4B
- Appraisal of Water Resources in the Hackensack River Basin, New Jersey,
W77-03336 2F
- Summary of Geology and Ground-Water Resources of Passaic County, New Jersey,
W77-03345 4B
- Ground-Water Resources of Greeley and Wichita Counties, Western Kansas,
W77-03347 4B

WATERSHED MANAGEMENT

- Hydrologic Inventory of the San Rafael Study Unit,
W77-03552 4A

WATERSHED PARAMETERS

- The Unit Hydrograph: A Satisfactory Model of Watershed Response,
W77-03126 4D

WATERSHEDS (BASINS)

- State and County Area Tabulations for the Colorado River Basin,
W77-03110 7C
- OPTRM - A Hydrologic Transport Model With Parameter Optimization,
W77-03115 5B
- Environmental Status of the Lake Michigan Region. Vol. 17. Inland Fishes of the Lake Michigan Drainage Basin,
W77-03566 6G

WATERWAY DISTRICTS

- Waterway Districts,
W77-03516 6E

WAVE CLIMATES

- Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska,
W77-03245 2L

WAVE ENERGY

- Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska,
W77-03245 2L

WAVE REFRACTION

- Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska,
W77-03245 2L

WAVES (WATER)

- High-Wave Conditions Observed Over the North Atlantic in September 1961,
W77-03090 2L
- Landslide Generated Water Wave Model,
W77-03318 8B

WEATHER DATA

- Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska,
W77-03245 2L

WEATHER FORECASTING

- Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska,
W77-03235 5B

WEATHER MODIFICATION

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary,
W77-03212 3B
- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume I - Meteorology and Hydrology of the Northern Sierra Nevada, Final Report,
W77-03213 3B
- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume II - Physical and Statistical Design, Final Report,
W77-03214 3B
- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume III - Operational Design, Final Report,
W77-03215 3B
- Electrostatic Induction Parameters to Attain Maximum Spray Charge to Clear Fog,
W77-03299 3B
- Artificial Modification of Atmospheric Processes,
W77-03303 3B

WEIRS

- Experimental Investigation of Flow Over Side Weirs,
W77-03317 8B

WELL DATA

- The Occurrence of Groundwater in the Satpura Region of Central India,
W77-03146 4B
- Appraisal of Water Resources in the Hackensack River Basin, New Jersey,
W77-03336 2F
- Summary of Geology and Ground-Water Resources of Passaic County, New Jersey,
W77-03345 4B
- Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California,
W77-03348 7C

WELLS

- Cache La Poudre Water Users Association V Glacier View Meadows (Appropriation of Water in Plan of Augmentation),
W77-03520 6E

WEST BRANCH DELAWARE RIVER (NY)

- Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York,
W77-03337 4A

WESTER US (WATER PROBLEMS)

- An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report,
W77-03157 6B

WESTERN UNITED STATES

- 1973 Western State Conference on Water Information Dissemination,
W77-03166 10C

WESTWIDE STUDY REPORT

- An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report,
W77-03157 6B

WETLANDS

- The Effects of Sewage Effluent on Wetland Ecosystems,
W77-03354 5C

WHEATGRASSES

- Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions,
W77-03142 2D

WILDCAT CREEK (IN)

- Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana,
W77-03182 4A

WILDLIFE

- Multiple Use in the Southern Coastal Plains in the United States,
W77-03173 4C

WILMINGTON CANYON

- Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States,
W77-03332 2L

WINDS

- Electronic Sensor for Low-to-Medium Windspeeds,
W77-03099 7B
- Wind-Induced Water Level Oscillations in Shallow Lagoons,
W77-03287 2H

WINDSPEED SENSORS

- Electronic Sensor for Low-to-Medium Windspeeds,
W77-03099 7B

WINTER

- Shelters Boost Winter Treatment Efficiencies,
W77-03432 5D

WINTER STORMS

- Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary,
W77-03212 3B

WISCONSIN

- Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin,
W77-03077 5C

- Distribution and Feeding of Pumpkinseed (*Lepomis gibbosus*) and Black Crappie (*Pomoxis nigromaculatus*) in a power plant cooling lake,
W77-03078 5C

- Organic Phosphorus in Lakes,
W77-03210 5C

- Probable Maximum Flood at Lake Chippewa near Winter, Wisconsin,
W77-03349 4A

- Public Inland Lake Protection and Rehabilitation,
W77-03510 6E

- Great Lakes Compact Commission,
W77-03513 6E

WITHDRAWAL

- Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir,
W77-03129 4A

SUBJECT INDEX

ZOOPLANKTON

A Perturbation Approach to Two-Dimensional
Bottom Withdrawal from a Density-Stratified
Reservoir,
W77-03151 4A

WYOMING

Permeability and Ground Water Circulation in
the Madison Aquifer Along the Eastern Flank
of the Bighorn Mountains of Wyoming,
W77-03122 2F

Hydrologic Studies by the U.S. Geological Sur-
vey in Oil-Shale Areas of Colorado, Utah, and
Wyoming, 1976.
W77-03340 4B

Water Rights and Liens.
W77-03499 6E

Poisoning of, and Obstruction to, Fish.
W77-03500 6E

Ditch Companies.
W77-03501 6E

Irrigation and Water Rights.
W77-03502 6E

Control of Water and Eminent Domain.
W77-03503 6E

The Wyoming Water Quality Act and the
Federal Water Pollution Control Act Amend-
ments of 1972: A Comparison,
W77-03600 5G

WYPER ARROYO (NM)

Flood Plain Information: San Juan River and
Tributaries, Farmington, New Mexico.
W77-03176 4A

ZINC TOXICITY

Effect of Zinc-Coated Culverts on Vertebrate
and Invertebrate Fauna in Selected Maine
Streams,
W77-03170 5C

ZONING

The Cost of Coastal Zoning.
W77-03535 6E

ZOOPLANKTON

Distribution of Pelagic Zooplankton within a
Thermal Gradient in Lake Columbia, a Cooling
Lake near Portage, Wisconsin,
W77-03077 5C

AUTHOR INDEX

- AAGAARD, K.**
Current Measurements in the Beaufort Sea,
W77-03228 2L
- STD Mappings of the Beaufort Sea Shelf,**
W77-03233 2L
- ABELIOVICH, A.**
Toxicity of Ammonia to Algae in Sewage Ox-
idation Ponds,
W77-03413 5D
- ACKERMAN, T. L.**
A Comparison of Seasonal Primary Production
of Mojave Desert Shrubs During Wet and Dry
Years,
W77-03138 2I
- ADAMS, J. H. JR.**
A Preliminary Study of the Taste and Odor
Problems in Grand Lake, Ohio and the Wabash
Rivers, Indiana,
W77-03384 5C
- ADAMS, R. T.**
Simulation of Pesticide Movement on Small
Agricultural Watersheds,
W77-03540 5B
- ALBANESE, R. H.**
Infiltration/Inflow Improvements in the Oyster
Bay Sewer District,
W77-03401 5D
- ALI KHAN, M. Z.**
A Butane Freezing Process for Dewatering
Sludge,
W77-03153 5D
- ALLAN, J. D.**
Seasonal Interactions Among Estuarine Prima-
ry Producers and Herbivores,
W77-03387 2L
- ALLANSON, B. R.**
The Primary Production of Lake Sibaya,
Kwazulu, South Africa,
W77-03376 5C
- ALLOS, M. R.**
Experiments on Wastewater Sedimentation,
W77-03574 5D
- ALMASSY, M. Y.**
A Study of the Suspended Particulate Problem
in the Duwamish Basin,
W77-03291 5A
- ANDERSON, K. B.**
Effects of Potassium on Adult Asiatic Clams,
Corbicula Manilensis,
W77-03119 5C
- ANDERSON, M. A.**
A Preliminary Study of the Taste and Odor
Problems in Grand Lake, Ohio and the Wabash
Rivers, Indiana,
W77-03384 5C
- ANDERSON, S. S.**
Effects of Oil Pollution on Breeding Grey
Seals,
W77-03187 5C
- ARMU, L.**
The Bottom Boundary Layer of the Deep
Ocean,
W77-03089 2L
- ARTEMCHUK, N. YA.**
Ecology of Aquatic Saprophytic Phyco-
mycetes. II, (In Russian),
W77-03201 5C
- ASARIN, A. E.**
Precipitation on the Aral Sea Surface, (In Rus-
sian),
W77-03592 2B
- ASHLEY, C. S.**
Heat Inactivation of Poliovirus in Waste Water
Sludge,
W77-03448 5C
- ASPIN, D.**
Rainfall in the Seychelles 1941 to 1970,
W77-03096 2B
- ASSELIN, YVAN**
Precautions to be Taken in the Construction
and Maintenance of Water Supply and Sewer
Systems (Precautions a Prendre Dans La Con-
struction Et L'Entretien Des Reseaux D'
Aqueduc Et D'Egout),
W77-03400 8G
- ATLAS, R. M.**
Assessment of Potential Interactions of
Microorganisms and Pollutants Resulting from
Petroleum Development on the Outer Con-
tinental Shelf in the Beaufort Sea,
W77-03217 5C
- Assessment of Potential Interactions of
Microorganisms and Pollutants Resulting from
Petroleum Development on the Outer Con-
tinental Shelf in the Gulf of Alaska,**
W77-03218 5C
- AVARIA, S.**
Phytoplankton Ecology in Valparaiso Bay: III.
Phytoplankton from 1972-73, (In Spanish),
W77-03200 5C
- AZOV, Y.**
Toxicity of Ammonia to Algae in Sewage Ox-
idation Ponds,
W77-03413 5D
- BAIKOVSKII, V. V.**
Comparative Assessment of the Effectiveness
of Certain Methods Making Industrial Effluents
Noncarcinogenic, (In Russian),
W77-03488 5D
- BAKR, H. M. A.**
Effect of Drought Stress Frequencies at Dif-
ferent Growth Stages on Corn Yield,
W77-03143 3F
- BALL, J. W.**
Cavitation From Surface Irregularities in High
Velocity,
W77-03082 8B
- BAMBERG, S. A.**
Comparative Photosynthetic Production of
Mojave Desert Shrubs,
W77-03141 2D
- A Comparison of Seasonal Primary Production
of Mojave Desert Shrubs During Wet and Dry
Years,**
W77-03138 2I
- BANOUB, M. W.**
Experimental Studies on Material Transactions
Between Mud and Water of the Gnadensee,
W77-03370 5C
- BARBER, N.**
Sodium Bicarbonate Neutralizes,
W77-03570 5D
- BARKER, R. E.**
Rates of Photosynthesis and Transpiration and
Diffusive Resistance of Six Grasses Grown
under Controlled Conditions,
W77-03142 2D
- BARNARD, J. R.**
Projections of Population, Employment, In-
come and Water Use for Iowa River Basins,
1975-2020,
W77-03542 6D
- BARNES, D.**
The Rotating Biological Filter,
W77-03282 5D
- BARNES, P.**
Distribution and Character of Icings in
Northeastern Alaska,
W77-03252 2C
- Marine Environmental Problems in the Ice
Covered Beaufort Sea Shelf and Coastal Re-
gions,**
W77-03250 2L
- Offshore Permafrost Studies, Beaufort Sea,**
W77-03249 2L
- Surface Current Observations - Beaufort Sea,
1972,**
W77-03251 2L
- BARRICK, D. E.**
Development and Operation of HF Current-
Mapping Radar Units-Physical Oceanography,
W77-03227 5B
- BARRY, R. G.**
Study of Climatic Effects on Fast Ice Extent
and its Seasonal Decay Along the Beaufort Sea
Coast,
W77-03270 2C
- BARSDATE, R.**
Microbial Release of Soluble Trace Metals
from Oil Impacted Sediments,
W77-03225 5C
- BARSVARY, A. K.**
Undrained Behavior of Embankments on New
Liskeard Varved Clay,
W77-03108 8D
- BATEMAN, R. L.**
Water Quality Simulation of Tahoe-Truckee
System, Nevada-California - Volume II - Ap-
pendices,
W77-03351 5A
- BAUER, S. B.**
Heavy Metals in Lakes of the Coeur d'Alene
River Valley, Idaho,
W77-03207 5B
- BAUMANN, E. R.**
The Electrolytic Respirometer - I. Factors Af-
fecting Oxygen Uptake Measurements,
W77-03457 5A
- BEAMISH, F. W. H.**
Effect of Copper on Some Aspects of the
Bioenergetics of Rainbow Trout (*Salmo gaird-
neri*),
W77-03203 5C

AUTHOR INDEX

BEARD, L. R.

BEARD, L. R.

Hydrologic Engineering Methods for Water Resources Development, Volume 5, Hypothetical Floods, W77-03104 8B

BEARDSLEY, J. A.

Sludge Drying Beds are Practical: Part 2, W77-03572 5D

BEBIN, J.

Origin of Nitrogen Pollution in Surface and Waste Waters (Origines Des Pollutions Azotees Dans Les Eaux Superficielles Et Les Eaux Usees), W77-03423 5D

BECK, K.

Bear River Evaluation Report, 1974 Survey, W77-03292 5B

BECKER, G. C.

Environmental Status of the Lake Michigan Region. Vol. 17. Inland Fishes of the Lake Michigan Drainage Basin, W77-03566 6G

BEHRENS, P. J.

Calibration of a Thermal Enrichment Model for Shallow, Barricaded Estuaries, W77-03171 5B

BELL, R. G.

The Limitation of the Ratio of Fecal Coliforms to Total Coliphage as a Water Pollution Index, W77-03472 5A

BELON, A. E.

Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies, W77-03277 7B

BENECH, V.

Growth, Mortality and Production of Brachysynodontis Batensoda (Pisces, Mochocidae) in the Southeastern Archipelago of Lake Tchad, (In French), W77-03597 2H

BENEFIELD, L. D.

Elemental Distribution Diagrams for Biological Wastewater Treatment, W77-03429 5D

BENNETT, E. R.

Research Needs for the Potable Reuse of Municipal Wastewater, W77-03356 5D

BENNETT, G. F.

Investigation of Oxygen Transfer to Slime as a Surface Reaction, W77-03476 5B

BERG, R.

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

BERNARD, D. R.

Reproduction by Adfluvial Salmonids in Spawn Creek, Cache County, Utah, W77-03160 2I

BEUSCHER, J. H.

Water Rights, W77-03599 6E

BILHAM, R.

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

BIRMINGHAM, A. D.

Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I, W77-03288 6E

BLOUIN, S.

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

BOCK, P.

Correlation Analysis of Hydrometeorological Data, W77-03086 2A

BOHR, R.

The Primary Production of the Periphyton Association Oedogonio-Epithemietum Litoralae, W77-03374 5C

BOKUNIEWICZ, H. J.

Sediment Mass Balance of a Large Estuary, Long Island Sound, W77-03323 2L

BONGARTZ, R.

Freedom of Beach, W77-03584 6E

BOONE, C. G.

Feasibility of Transplantation, Revegetation, and Restoration of Eelgrass in San Diego Bay, California, W77-03546 5G

BOOTHROYD, J. C.

Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B

BOROVSKII, V. M.

Factors of Soil Salinization During Irrigation in the Turan Lowland, (In Russian), W77-03124 2G

BORTLESON, G. C.

Data on Selected Lakes in Washington, Part 5, W77-03350 7C

BOSCH, H.

Activated Carbon From Activated Sludge, W77-03425 5D

BOUMA, A. H.

Faulting and Instability of Shelf Sediments - Western Gulf of Alaska, W77-03264 2L

BOUWER, H.

Virus and Bacterial Removal from Waste Water by Land Treatment, W77-03447 5D

BOVING, P. A.

Electronic Sensor for Low-to-Medium Windspeeds, W77-03099 7B

BOWDEN, G.

Hurdles in the Path of Coastal Plan Implementation, W77-03582 6B

BOWLES, D. S.

Low Flow Modeling in Small Steep Watersheds, W77-03316 4D

BOYLE, W. C.

Intermittent Sand Filtration of Household Wastewater, W77-03452 5D

BRADBURY, J. P.

The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota, W77-03375 5B

BRASHIER, C. K.

Silt Removal from a Lake Bottom, W77-03392 5C

BREBBIA, C. A.

Quadratic Finite Elements in Shallow Water Problems, W77-03083 8B

BREEN, P. A.

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

BRICKER, O. P.

A Model for the Control of Dissolved Manganese in the Interstitial Waters of Chesapeake Bay, W77-03556 5B

BRISBIN, S. G.

Concentric Waste-Treatment Plant Saves Land, Cuts Cost, W77-03427 5D

BROCKWELL, J. L.

Investigation of Oxygen Transfer to Slime as a Surface Reaction, W77-03476 5B

BROWER, W. A. JR.

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases, W77-03240 5B

BROWN, C. G.

Design and Control of Nitrifying Activated Sludge Systems, W77-03426 5D

BROWN, J.

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C

BROWN, K. W.

Water Stress Induced Alterations of the Stomatal Response to Decreases in Leaf Water Potential, W77-03140 2I

BUCKNER, J. L.

Multiple Use in the Southern Coastal Plains in the United States, W77-03173 4C

BUCKNEY, R. T.

Aspects of the Chemical Variability of some Tasmanian Inland Waters (Australia), W77-03283 2K

Chemical Composition of Some Inland Surface Waters in South, Western, and Northern Australia, W77-03286 2K

Chemistry of Salt Lakes and Other Waters in the Sub-Humid Regions of Tasmania (Australia), W77-03284 2H

AUTHOR INDEX

CUNEO, J.

- Stability of Ionic Proportions in Five Salt
Lakes in Victoria, Australia,
W77-03285 2H
- BUTUM, I.
Risk of Communicable Disease Infection As-
sociated with Waste Water Irrigation in
Agricultural Settlements,
W77-03485 5C
- BURNS, D. E.
Factors Affecting Powdered Carbon Treatment
of a Municipal Wastewater,
W77-03430 5D
- BURRELL, D. C.
Natural Distribution of Trace Heavy Metals
and Environmental Background in Three
Alaska Shelf Areas,
W77-03222 5B
- BUTLER, H. L.
Landslide Generated Water Wave Model,
W77-03318 8B
- BUZOVKIN, M. I.
Biological Treatment of Sewage Waters -
Device with Internal Aeration Zone,
W77-03404 5D
- CABLE, M. S.
Coastal Morphology and Sedimentation, Gulf
Coast of Alaska (Glacial Sedimentation),
W77-03244 5B
- CALLAWAY, R. J.
Transport of Pollutants in the Vicinity of Prud-
hoe Bay, Alaska,
W77-03238 5B
- CAMPBELL, F. J.
Ship-to-Shore Sewage Hose Handling Tests,
W77-03364 5D
- CAMPBELL, R. B.
Diurnal Fluctuation of Leaf-Water Potential of
Corn as Influenced by Soil Matric Potential and
Microclimate,
W77-03394 3F
- CANNON, P. J.
The Environmental Geology and Geomorpholo-
gy of the Gulf of Alaska Coastal Plain,
W77-03246 2L
- CANNON, R. E.
Cyanophage Analysis as a Biological Pollution
Indicator-Bacterial and Viral,
W77-03460 5A
- CARACICH, I. G.
Grant Aid for Plant Operations: An Evaluation,
W77-03483 5G
- CARDER, K. L.
Calibration of a Thermal Enrichment Model for
Shallow, Barricaded Estuaries,
W77-03171 5B
- CAREY, J. H.
Ultraviolet Disinfection: An Alternative to
Chlorination,
W77-03445 5D
- CARLSON, K. T.
The People's Lake,
W77-03594 5G
- CARLSON, P. R.
Erosion and Deposition of Shelf Sediment:
Eastern Gulf of Alaska,
W77-03258 2L
- Faulting and Instability of Shelf Sediments:
Eastern Gulf of Alaska,
W77-03259 2L
- CARLSON, R. F.
Effects of Seasonability and Variability of
Streamflow on Nearshore Coastal Areas,
W77-03229 5C
- CARROZ, J. W.
Electrostatic Induction Parameters to Attain
Maximum Spray Charge to Clear Fog,
W77-03299 3B
- CARSWELL, L. D.
Appraisal of Water Resources in the Hacken-
sack River Basin, New Jersey,
W77-03336 2F
- Summary of Geology and Ground-Water
Resources of Passaic County, New Jersey,
W77-03345 4B
- CARTER, D.
Offshore Permafrost Studies, Beaufort Sea,
W77-03249 2L
- CASEY, J. P.
Removal of BOD and Nitrogenous Pollutants
from Wastewaters,
W77-03486 5D
- CHAKRABARTI, S. K.
High-Wave Conditions Observed Over the
North Atlantic in September 1961,
W77-03090 2L
- CHAMBERLAIN, E.
Delineation and Engineering Characteristics of
Permafrost Beneath the Beaufort Sea,
W77-03247 2C
- CHANGNON, S. A. JR.
A Review of Hail-Measuring Instruments,
W77-03101 2B
- CHAPMAN, T. D.
Effect of High Dissolved Oxygen Concentra-
tion in Activated Sludge Systems,
W77-03571 5D
- CHARACKLIS, W. G.
The Influence of Carbon-Nitrogen Ratio on the
Chlorination of Microbial Aggregates,
W77-03414 5D
- CHASSAING, B.
Biogeochemical Development of the Lake of
Geneva (Switzerland) from 1957 to 1973: Part
III, (In French),
W77-03144 5C
- CHEEK, L. M.
Macoma Balhica: An Indicator of Oil Pollu-
tion,
W77-03185 5A
- CHEREMISINOFF, P. N.
Sludge Dewatering Pilot Plant Design, Part I,
W77-03416 5D
- CHESLER, S. N.
Trace Hydrocarbon Analysis in Previously Stu-
died Matrices and Methods Development for:
(A) Trace Hydrocarbon Analysis in Sea Ice and
at the Sea Ice-Water Interface, (B) Analysis of
Individual High Molecular Weight Aromatic
Hydrocarbons,
W77-03219 5A
- CHIN CHOY, E. W.
Evapotranspiration Reduction by Field
Geometry Effects,
W77-03169 2D
- CHU, K. W.
Weather Modification Design Study for
Streamflow Augmentation in the Northern Sier-
ra Nevada, Executive Summary,
W77-03212 3B
- CHURCHILL, C. L.
Silt Removal from a Lake Bottom,
W77-03392 5C
- CLARKSON, N. M.
Effect of Water Stress on the Phasic Develop-
ment of Annual Medicago Species,
W77-03136 2I
- CLEASBY, J. L.
Effect of Variable Loading on Oxygen Uptake,
W77-03473 5D
- CLINE, J.
Distribution of Light Hydrocarbons, C1-C14, in
the Northeast Gulf of Alaska and the
Southeastern Bering Shelf,
W77-03221 5B
- CLINE, J. D.
Distribution, Composition and Transport of
Suspended Particulate Matter in the Gulf of
Alaska and Southeastern Bering Shelf,
W77-03248 2L
- CLUFF, C. B.
Plastic-Reinforced Asphalt Seepage Barrier,
W77-03120 3B
- COACHMAN, L. K.
Bristol Bay Oceanographic Processes (B-BOP),
W77-03232 5B
- COMPERE, A. L.
Fermentation of Waste Materials to Produce
Industrial Intermediates,
W77-03563 5D
- CORMIER, V. F.
A Seismotectonic Study of Seismic and Vol-
canic Hazards in the Pribilof Islands - Eastern
Aleutian Islands Region of the Bering Sea,
W77-03243 2L
- COSNER, O. J.
Measured and Simulated Ground-Water Levels
in the Franklin Area, Southeastern Virginia,
W77-03326 7C
- CRETNEY, W. J.
Distribution and Source of Tar on the Pacific
Ocean,
W77-03191 5B
- CULLINANE, J. P.
The Effect of Oil Pollution in Bantry Bay,
W77-03194 5C
- Effects of Oil on Beaches in West Cork, Ire-
land,
W77-03192 5C
- CULVER, R. H.
Innovation is an Old Idea-With A Big Future,
W77-03482 5D
- CUNEO, J.
Analytical Studies for Assessing the Impact of
Sanitary Sewage Facilities of Delaware Coun-
ty, Ohio,
W77-03353 5D

AUTHOR INDEX

CZYZEWSKA, K.

CZYZEWSKA, K.

The Effect of Detergents on Larval Development of a Crab,
W77-03189 5C

D'ANGLEJAN, B.

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary,
W77-03091 2L

DADYKIN, V. P.

The Regulation of Transpiration Expenditure of Moisture by Plants with the Aid of Antitranspirants, (In Russian),
W77-03475 3B

DARNELL, P. E.

Conducting Sewer System Evaluations for Small Systems,
W77-03581 5D

DATSENKO, M. F.

Sanitary-Bacteriological Study of the Effectiveness of Decontaminating the Sewage of Voroshilovgrad on Sewage Farms, (In Russian),
W77-03128 5D

DAVENPORT, C. V.

Chlorine Disinfection of Treated Wastewater in a Baffled Contact Chamber at Less Than 1 C,
W77-03363 5D

DAVIES, J. N.

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea,
W77-03243 2L

DAVIS, J. E.

Effects of Oil Pollution on Breeding Grey Seals,
W77-03187 5C

DAY, A. D.

Effects of Soil-Moisture Regimes on the Growth of Barley,
W77-03216 3F

DE BOODT, M. F.

Prediction of Water Transmission in Conditioned Soils,
W77-03451 2G

DE HAAN, S.

Use of Sludge Left After Waste Water Decantation as a Fertilizer or Soil Conditioner (Les Boues de Decantation d Eau Residuairees Utilisees Comme Fertilisant ou Comme Conditionneur de Sols),
W77-03421 5D

DE WITT, K. J.

Investigation of Oxygen Transfer to Slime as a Surface Reaction,
W77-03476 5B

DEJONG, I. G.

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples,
W77-03202 5A

DEKRUIJF, H. A. M.

Toxicity of Crude Oils and a Dispersant to the Stony Coral *Madracis Mirabilis*,
W77-03196 5C

DENT, W. T.

Projections of Population, Employment, Income and Water Use for Iowa River Basins, 1975-2020,
W77-03542 6D

DILK, W. L.

Investigation of the Physical Feasibility of Mobile Fish Processing Plants,
W77-03558 6B

DION, N. P.

Data on Selected Lakes in Washington, Part 5,
W77-03350 7C

DIXON, T. J.

Olympic Alliance Oil Spillage,
W77-03195 5C

DIXON, T. R.

Olympic Alliance Oil Spillage,
W77-03195 5C

DOOLEY, M. E.

Ammonia Removal from Wastewater by Ligand Exchange,
W77-03367 5D

DOTY, C. W.

Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matric Potential and Microclimate,
W77-03394 3F

DOWNING, R. A.

Normal-Mode Analysis of the Structure of Baseflow Recession Curves,
W77-03313 2F

DRAKE, D.

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions,
W77-03250 2L

Offshore Permafrost Studies, Beaufort Sea,
W77-03249 2L

DUGGAN, J. B.

Effect of Variable Loading on Oxygen Uptake,
W77-03473 5D

DUNCAN, C. W.

Infiltration/Inflow - The Kansas Connection,
W77-03479 5G

DUNN, B.

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York,
W77-03337 4A

DUPRE, W. R.

Yukon Delta Coastal Processes Study,
W77-03255 2L

DUTKA, B. J.

Microbiological Examination of Waters and Effluents,
W77-03470 5A

DYDEK, S. T.

The Influence of Carbon-Nitrogen Ratio on the Chlorination of Microbial Aggregates,
W77-03414 5D

EASTBURN, R. P.

Treatment of Livestock Wastes by a Barriered Landscape Water Renovation System,
W77-03116 5D

ECKENFELDER, W. W. JR.

Aeration and Oxygen Transfer in Biological Reactors,
W77-03575 5D

EDELEN, G. W. JR.

National Program for Managing Flood Losses: Guidelines for Preparation, Transmittal, and Distribution of Flood-Prone Area Maps and Pamphlets,
W77-03341 7C

EDWARDS, L. L.

An Economic Evaluation of Deep Tank Aeration for Wastewater Treatment,
W77-03580 5D

EDWARDS, R. N.

Sewerage Treatment Apparatus,
W77-03406 5D

EISENREICH, S. J.

Organic Phosphorus in Lakes,
W77-03210 5C

EL-KHASHAB, A.

Experimental Investigation of Flow Over Side Weirs,
W77-03317 8B

ELGERSHUIZEN, J. H. B. W.

Toxicity of Crude Oils and a Dispersant to the Stony Coral *Madracis Mirabilis*,
W77-03196 5C

ELLIOTT, B. A.

Salinity Induced Horizontal Estuarine Circulation,
W77-03312 2L

ENGLANDE, A. J. JR.

Effluent Variability Estimation for Complete-Mix Activated Sludge Treatment Systems,
W77-03434 5D

ESFANDI, A.

Inhibiting Nitrification in Wastewater Treatment Plants,
W77-03573 5D

EVANS, W. C.

Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California,
W77-03342 2K

FARMER, G. J.

Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*),
W77-03203 5C

FAUST, S. D.

The Kinetics of Adsorption of Phenols by Granular Activated Carbon,
W77-03149 5D

FAVORITE, F.

Physical Oceanography of the Gulf of Alaska,
W77-03241 5B

FEDDES, R. A.

Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function,
W77-03315 2G

FEDER, H. M.

Macoma Balthica: An Indicator of Oil Pollution,
W77-03185 5A

AUTHOR INDEX

GORDON, M.

- FEELY, R.**
Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B
- FEELY, R. A.**
Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf, W77-03248 2L
- FELDMAN, M.**
A Computer Program for Estimating Costs of Owning and Operating an Irrigation Well Under Conditions of Declining Water Levels, W77-03211 6C
- FELDT, L. E.**
Phytoplankton Response to Phosphorus and Silica Enrichments in Lake Michigan, W77-03537 5C
- FENG, S. Y.**
Effect of Temperature and Salinity on Extension of Siphons by *Mercenaria Mercenaria*, W77-03205 5C
- FICKE, H. H.**
An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D
- FIELDS, D. E.**
OPTRM - A Hydrologic Transport Model With Parameter Optimization, W77-03115 5B
- FISHER, W. W.**
Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides, W77-03132 5D
- FLANDER, S.**
The Muddy Road to Clean Water, W77-03587 5G
- FLETCHER, A.**
The Effect of Oil Pollution in Bantry Bay, W77-03194 5C
- FLUEHLER, H.**
The Transport of Pollutants in Ground Water, (In German), W77-03131 5B
- FOLEY, P. D.**
Monitoring of Community Water Supplies, W77-03463 5A
- FOLEY, R.**
Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota, W77-03094 5C
- FOLGER, D. W.**
Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States, W77-03332 2L
- FONTAINE, T. D. III**
Transferable Drug Resistance Associated with Coliforms Isolated from Hospital and Domestic Sewage, W77-03478 5A
- FORSBERG, A.**
Nature Preservation Activity RR Investigation: Part 6. A Modified Method of Measuring the Chemical Oxygen Demand Gives a High Analytical Capacity, (In Swedish), W77-03589 5A
- FRANCINGUES, N. R. JR**
Water Usage and Wastewater Characterization at a Crops of Engineers Recreation Area, W77-03362 5A
- FRANCIS, P. H.**
Strength of Ice Under Multiaxial Loading, W77-03301 2C
- FRANK, A. B.**
Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions, W77-03142 2D
- FRENCH, J. J.**
Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California, W77-03348 7C
- FRICKER, R. G.**
An Operator's Approach to Aerobic Digester Supernatant Disposal Problems, W77-03449 5D
- FROBEL, R. K.**
Plastic-Reinforced Asphalt Seepage Barrier, W77-03120 3B
- FROMMERT, I.**
A New Method of Automatic Determination of Nitrate in Waste Waters and Polluted Surface Waters (Ein Neues Verfahren Zur Automatischen Nitrat-Bestimmung in Abwaessern und Belasteten Oberflaechenwaessern), W77-03466 5A
- FUCHS, F.**
Investigations on the Importance of the Organic Chloro-Compounds and their Adsorbability (Untersuchungen Zur Bedeutung der Organischen Chlorverbindungen und Ihrer Adsorbierbarkeit), W77-03465 5A
- FUJIMOTO, J.**
Cultivation and Breeding of *Oenothera*-Plant: IV. Effect of Soil Moisture on Growth and Components in Seed of *O. Biennis*, (In Japanese), W77-03148 2I
- FURRER, O. J.**
The Phosphorus Pollution of Waters Due to Agriculture, (In German), W77-03134 5B
- GAHEEN, S. A.**
Effect of Drought Stress Frequencies at Different Growth Stages on Corn Yield, W77-03143 3F
- GALAGAN, N. P.**
Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in *Anodonta Cygnea*, (In Russian), W77-03366 5C
- GALT, J. A.**
Numerical Studies of Alaskan Region, W77-03231 5B
- GARDNER, R. A.**
High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida, W77-03344 7B
- GARDNER, W. R.**
Prediction of Water Transmission in Conditioned Soils, W77-03451 2G
- GARLOW, R.**
Surface Current Observations - Beaufort Sea, 1972, W77-03251 2L
- GARRETT, D.**
The Impact of Intensive Application of Pesticides and Fertilizers on Underground Water Recharge Areas which May Contribute to Drinking Water Problems, W77-03567 5B
- GARTON, J. E.**
Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification, W77-03208 2H
- GEBERT, J.**
Sediment Mass Balance of a Large Estuary, Long Island Sound, W77-03323 2L
- GEHRS, C. S.**
Photolysis of 5-Chlorouracil in Natural Waters, W77-03477 5B
- GERBA, C. P.**
Virus and Bacterial Removal from Waste Water by Land Treatment, W77-03447 5D
- GESSESSE, H.**
Soil Moisture Distribution Under Wide-Bed, Narrow-Row, and Conventional-Row Cotton, W77-03137 3F
- GIBSON, C. I.**
Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp, W77-03186 5C
- GILBERT, R. G.**
Virus and Bacterial Removal from Waste Water by Land Treatment, W77-03447 5D
- GILL, M. A.**
Exact Solution of Gradually Varied Flow, W77-03085 8B
- GILMAN, H. D.**
Automation: A Short History, But a Long Future, W77-03469 5D
- GOLDSTEIN, D. J.**
High Gradient Magnetic Filtration, W77-03418 5D
- GOMEZ-AGUIRRE, S.**
Plankton of Coastal Lagoons: XI. Transport in Three Estuaries of the Northwest of Mexico (November, 1973) (In Spanish), W77-03145 2L
- GOODWYN, P. P.**
One Pass Seawater Desalting RO Pilot Plant Evaluation, W77-03076 3A
- GORDON, M.**
Biological and Chemical Evaluation of the Aquatic Environment of Selected Undeveloped Kentucky Lake Embayments, W77-03209 5C

AUTHOR INDEX

GORDON, R. B.

GORDON, R. B.
Sediment Mass Balance of a Large Estuary,
Long Island Sound,
W77-03323 2L

GORDON, R. C.
Chlorine Disinfection of Treated Wastewater in
a Baffled Contact Chamber at Less Than 1 C,
W77-03363 5D

GOROCH, A. K.
Weather Modification Design Study for
Streamflow Augmentation in the Northern Sierra
Nevada, Executive Summary,
W77-03212 3B

GORSLINE, D. S.
Relationships Between Sand Input from Rivers
and the Composition of Sands from the
Beaches of Southern California,
W77-03324 2L

GRABOW, W. O. K.
Behaviour in Conventional Sewage Purification
Processes of Coliform Bacteria with Transferable
or Non-Transferable Drug-Resistance,
W77-03435 5D

GRACHEVA, M. P.
Comparative Assessment of the Effectiveness
of Certain Methods Making Industrial Effluents
Noncarcinogenic, (In Russian),
W77-03488 5D

GRAHAM, M. J.
Infiltration/Inflow - The Kansas Connection,
W77-03479 5G

GRANMO, A.
Effects on Fertilization and Development of
the Common Mussel, *Mytilus Edulis* After
Long-Term Exposure to a Nonionic Surfactant,
W77-03198 5C

GRANNEMANN, N. G.
Hydrogeology of the Missouri River Flood
Plain near Glasgow, Missouri,
W77-03164 2F

GRANTHAM, R. G.
Ground-Water Quality Data for Georgia,
W77-03333 7C

GREEN, A. J. JR.
Water Usage and Wastewater Characterization
at a Crops of Engineers Recreation Area,
W77-03362 5A

GREEN, D. R.
Distribution and Source of Tar on the Pacific
Ocean,
W77-03191 5B

GREEN, M.
The Muddy Road to Clean Water,
W77-03587 5G

GREGORY, R. W.
Effect of Zinc-Coated Culverts on Vertebrate
and Invertebrate Fauna in Selected Maine
Streams,
W77-03170 5C

GRIFFITH, W. L.
Fermentation of Waste Materials to Produce
Industrial Intermediates,
W77-03563 5D

GRIFFITHS, R. P.
Baseline Study of Microbial Activity in the
Beaufort Sea and Gulf of Alaska and Analysis

of Crude Oil Degradation by Psychrophilic
Bacteria,
W77-03223 5C

GRIFF, N.
Effects of Chronic DDT/DDE Exposure on
Anesthetic Induction and Recovery Times in
Rainbow Trout (*Salmo Gairdneri*),
W77-03204 5C

GUMP, B. H.
Trace Hydrocarbon Analysis in Previously Studied
Matrices and Methods Development for:
(A) Trace Hydrocarbon Analysis in Sea Ice and
at the Sea Ice-Water Interface, (B) Analysis of
Individual High Molecular Weight Aromatic
Hydrocarbons,
W77-03219 5A

GUPTA, S. K.
A Three-Dimensional Finite Element Ground
Water Model,
W77-03109 2F

GUY, M. D.
The Application of the Foam Fractionation
Process to the Removal of Viruses. Part I. The
Production of a Mathematical Model to Predict
the Efficiency of Virus Removal,
W77-03433 5D

GWYN, J. E.
Fluidized Waste Incinerator and Method,
W77-03489 5D

HAAS, J. H. JR.
The Kinetics of Adsorption of Phenols by
Granular Activated Carbon,
W77-03149 5D

HAINES, R. F.
Sludge - Where Will We Put It,
W77-03424 5E

HAIRSTON, H. G. JR.
Response of *Daphnia* Population Size and Age
Structure to Predation,
W77-03390 2H

HALLIDAY, R. A.
Retransmission of Hydrometric Data in
Canada,
W77-03111 7B

HAMBREY, M. J.
Structure of the Glacier Charles Rabots Bre,
Norway,
W77-03311 2C

HAMILTON, R. A.
Breakup Flooding and Nutrient Source of Col-
ville River Delta During 1973,
W77-03388 5B

HAMPTON, M. A.
Faulting and Instability of Shelf Sediments -
Western Gulf of Alaska,
W77-03264 2L

HAMRICK, R. L.
Useful Modeling Concepts for the FCD Water
System,
W77-03524 6A

HANSEN, D. V.
Outer Continental Shelf Energy Program,
W77-03234 5B

HANSFORD, G. S.
A Study of Substrate Removal in a Microbial
Film Reactor,
W77-03480 5D

HARA, T. J.
Effects of Mercury and Copper on the Olfactory
Response in Rainbow Trout, *Salmo Gairdneri*,
W77-03184 5C

HARDEN, D.
Distribution and Character of Icings in
Northeastern Alaska,
W77-03252 2C

HARDT, W. F.
Selected Data on Water Wells, Geothermal
Wells, and Oil Tests in Imperial Valley,
California,
W77-03348 7C

HARLAND, J. R.
High Gradient Magnetic Filtration,
W77-03418 5D

HARRIS, N. P.
A Study of Substrate Removal in a Microbial
Film Reactor,
W77-03480 5D

HARRISON, R. M.
Effect of Water Chlorination Upon Levels of
Some Polynuclear Aromatic Hydrocarbons in
Water,
W77-03459 5F

HARRISON, W. D.
Mechanics of Origin of Pressure Ridges, Shear
Ridges and Hummock Fields in Landfast Ice,
W77-03271 2L

Offshore Permafrost-Drilling, Boundary Conditions,
Properties, Processes and Models,
W77-03261 5B

HART, R. C.
The Primary Production of Lake Sibaya,
Kwazulu, South Africa,
W77-03376 5C

HARTMAN, R. T.
Experimental Ecology of Selected Vertebrate
Species,
W77-03564 6G

HASKE, C. M.
Beaufort Sea, Chukchi Sea, Bering Strait
Historical Baseline Ice Study,
W77-03275 2C

HASKIN, H. H.
Effect of Temperature and Salinity on Extension
of Siphons by *Mercenaria Mercenaria*,
W77-03205 5C

HAUGEN, D.
Current Measurements in the Beaufort Sea,
W77-03228 2L

HAWKES, H. A.
Laboratory Studies on the Effects of Temperature
on Accumulation of Solids in Biological
Filters,
W77-03464 5D

HAYES, J. V.
Aerosol Production by Irrigation Equipment
Used for Land Application of Waste Water,
W77-03484 5A

HAYES, S. P.
Gulf of Alaska Study of Mesoscale Oceanographic
Processes (Gas-Mop),
W77-03230 6G

AUTHOR INDEX

JAMES, D. R.

- HEERDEGEN, R. G.**
Seasonal Demarcation in Pennsylvania for Hydrological Use, W77-03127 2B
- The Unit Hydrograph: A Satisfactory Model of Watershed Response, W77-03126 4D
- HEILMAN, P.**
Effect of Added Salts on Nitrogen Released and Nitrate Levels in Forest Soils of the Washington Coastal Area, W77-03396 2G
- HEINLE, D. R.**
Seasonal Interactions Among Estuarine Primary Producers and Herbivores, W77-03387 2L
- HELFGOTT, T. B.**
Minimizing the Waste Discharges from Water Treatment Plants, W77-03455 5D
- HENDERSON, R. W.**
Denver's Headworks Reflects Complexity of System, W77-03412 5D
- HENKIN, L. H.**
A Closer Look at Some Issues for Genera-Oceans Policy, Marine Environment, and Fisheries, W77-03585 6E
- HERSON, A.**
Land Based Sewage Sludge Management Alternatives for Los Angeles: Evaluation and Comparison, W77-03289 5D
- HERTZ, H. S.**
Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons, W77-03219 5A
- HETTLING, L. J.**
Grant Aid for Plant Operations: An Evaluation, W77-03483 5G
- HINCHCLIFFE, P. R.**
Surf-Zone Water Quality in Liverpool Bay, W77-03092 5B
- HIRAOKA, M.**
Combined Process of Pyrolysis and Combustion for Sludge Disposal, W77-03415 5D
- HO, C. L.**
Breakup Flooding and Nutrient Source of Colville River Delta During 1973, W77-03388 5B
- HO, F. P.**
Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida, W77-03304 2L
- HO, J. C.**
A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03151 4A
- Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A
- HOADLEY, A. W.**
Transferable Drug Resistance Associated with Coliforms Isolated from Hospital and Domestic Sewage, W77-03478 5A
- HOEPEL, R. E.**
Feasibility of Transplantation, Revegetation, and Restoration of Eelgrass in San Diego Bay, California, W77-03546 5G
- HOLDREN, G. R.**
A Model for the Control of Dissolved Manganese in the Interstitial Waters of Chesapeake Bay, W77-03556 5B
- HOLLIS, G. E.**
The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England, W77-03314 4C
- HOLMES, J. W.**
Water Resources of Australia and the Pattern of Population Concentrations, W77-03278 6D
- HOLST, R. W.**
Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois, W77-03565 5A
- HOPKINS, D.**
Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L
- HOPKINS, D. M.**
Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin, W77-03256 2L
- Yukon Delta Coastal Processes Study, W77-03255 2L
- HOPKINS, G. R.**
Scour Around Bridge Piers, W77-03294 8B
- HORNBERGER, G. M.**
Methods of Dissolved Oxygen Budget Analysis for Assessing Effects of Dredged Material Disposal on Biological Community Metabolism, W77-03393 5C
- HOSKIN, C. M.**
Benthos-Sedimentary Substrate Interactions, W77-03263 5C
- HOSKINS, E. R.**
Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice, W77-03276 2C
- HOUSE, L.**
A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L
- HUDSON, J. D.**
Ground-Water Levels in New Mexico, 1975, W77-03330 7C
- HUFF, F. A.**
Relation Between Atmospheric Pollution, Precipitation, and Streamwater Quality Near A Large Urban-Industrial Complex, W77-03097 5B
- HUGHES, L. A.**
Guidelines for Flash Flood and Small Tributary Flood Prediction, W77-03114 4A
- HUGHES, T. C.**
User Oriented Systems Analysis for Regional Municipal Water Supply Planning, W77-03159 6A
- HUNT, W. R.**
Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study, W77-03275 2C
- HUNTOON, P. W.**
Permeability and Ground Water Circulation in the Madison Aquifer Along the Eastern Flank of the Bighorn Mountains of Wyoming, W77-03122 2F
- IKEDA, S.**
Flow and Bed Topography in Curved Open Channels, W77-03084 8B
- IL'NITSKII, A. P.**
Permissible Level of Benzo(A)Plyrene in Water Bodies, (In Russian), W77-03117 5B
- INGRAM, R. G.**
Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary, W77-03091 2L
- INNES, J. K.**
Data on Selected Lakes in Washington, Part 5, W77-03350 7C
- ISOBE, M.**
Calibration of Neutron Probe in Some Selected Hawaiian Soils, W77-03321 2G
- IVANYUKOV, D. V.**
Biological Treatment of Sewage Waters - Device with Internal Aeration Zone, W77-03404 5D
- IWUGO, K. O.**
A Study of Mixing Characteristics of Sewage Stabilization Ponds with Radioactive Tracers, W77-03461 5D
- JACKSON, M. L.**
An Economic Evaluation of Deep Tank Aeration for Wastewater Treatment, W77-03580 5D
- Oxygen Transfer in a 23-Meter Bubble Column, W77-03579 5D
- JACOB, K. H.**
A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L
- JAMES, D. R.**
Oxygen Transfer in a 23-Meter Bubble Column, W77-03579 5D

AUTHOR INDEX

JARRELL, H. R.

JARRELL, H. R.

Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification,
W77-03208 2H

JERGER, D. E.

Aquatic Field Survey at Iowa Army Ammunition Plant,
W77-03386 5C

JERIS, J. S.

Biochemical Mechanisms in the Methane Fermentation of Glutamic and Oleic Acids,
W77-03441 5D

JOHNSON, C. S.

Silt Removal from a Lake Bottom,
W77-03392 5C

JOHNSON, J. H.

Physical Oceanography of the Gulf of Alaska,
W77-03241 5B

JORDON, W. R.

Water Stress Induced Alterations of the Stomatal Response to Decreases in Leaf Water Potential,
W77-03140 2I

JORGENSEN, G.

Effects on Fertilization and Development of the Common Mussel, *Mytilus Edulis* After Long-Term Exposure to a Nonionic Surfactant,
W77-03198 5C

JORGENSEN, J. H.

Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water,
W77-03474 5A

KADLEC, J. A.

The Effects of Sewage Effluent on Wetland Ecosystems,
W77-03354 5C

KADLEC, R. H.

The Effects of Sewage Effluent on Wetland Ecosystems,
W77-03354 5C

KALINSKE, A. A.

Comparison of Air and Oxygen Activated Sludge Systems,
W77-03443 5D

Innovation is an Old Idea--With A Big Future,
W77-03482 5D

KALVINSKAS, J. J.

Sewage Sludge Treatment System,
W77-03487 5D

KASRAIE, B.

Scour Around Bridge Piers,
W77-03294 8B

KATZ, H.

The Impact of Intensive Application of Pesticides and Fertilizers on Underground Water Recharge Areas which May Contribute to Drinking Water Problems,
W77-03567 5B

KATZENELSON, E.

Risk of Communicable Disease Infection Associated with Waste Water Irrigation in Agricultural Settlements,
W77-03485 5C

KATZER, J. R.

An Evaluation of Aqueous Phase Catalytic Oxidation,
W77-03079 5D

KEEFER, G. D.

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower,
W77-03135 3F

KELLER, P. N.

Electrostatic Induction Parameters to Attain Maximum Spray Charge to Clear Fog,
W77-03299 3B

KELLY, M. G.

Methods of Dissolved Oxygen Budget Analysis for Assessing Effects of Dredged Material Disposal on Biological Community Metabolism,
W77-03393 5C

KERSHAW, M. A.

Tertiary Treatment of Sewage Effluents,
W77-03453 5D

KHRISTIANOVA, L. A.

Determination of Arsenic in Drinking Water by Means of Silver Diethyldithiocarbamate, (In Russian),
W77-03113 5A

KICKUTH, R.

Specific Role of Lime in Municipal Waste Water Treatment-Expectations and Reality (Die Spezifische Rolle Des Kalks in Der Kommunalen Abwasserreinigung-Erwartungen Und Realitaeten),
W77-03422 5D

KIENLE, J.

Seismic and Volcanic Risk Studies - Western Gulf of Alaska,
W77-03260 2L

KIKKAWA, H.

Flow and Bed Topography in Curved Open Channels,
W77-03084 8B

KINCANNON, D. F.

Inhibiting Nitrification in Wastewater Treatment Plants,
W77-03573 5D

KIRBY, J. R.

Infiltration/Inflow - The Kansas Connection,
W77-03479 5G

KISHI, Z.

Changes in the Transpiration Rate and Leaf Water Content in Several Varieties of *Cryptomeria Japonica* Subjected to Water Stress, (In Japanese),
W77-03155 2D

KITAGAWA, A.

Flow and Bed Topography in Curved Open Channels,
W77-03084 8B

KLAVERKAMP, J. F.

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*),
W77-03204 5C

KLEEREBEZEM, G. J.

Activated Carbon From Activated Sludge,
W77-03425 5D

KLEINKOPF, G. E.

Comparative Photosynthetic Production of Mojave Desert Shrubs,
W77-03141 2D

A Comparison of Seasonal Primary Production of Mojave Desert Shrubs During Wet and Dry Years,
W77-03138 2I

KLIMEK, J. C.

Grant Aid for Plant Operations: An Evaluation,
W77-03483 5G

KNAUER, G. A.

Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment,
W77-03188 5B

KNEBEL, H. J.

Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States,
W77-03332 2L

KNOWLES, C. E.

Flow Dynamics of the Neuse River Estuary,
W77-03300 2L

KNUTZEN, J.

Water Quality, Plankton and Eutrophication of Bergsvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian),
W77-03595 5C

KOBLINSKY, C.

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska,
W77-03238 5B

KOENIG, R.

A New Method of Automatic Determination of Nitrate in Waste Waters and Polluted Surface Waters (Ein Neues Verfahren Zur Automatischen Nitrat-Bestimmung in Abwaessern und Belasteten Oberflaechenwaessern),
W77-03466 5A

KOKINA, A. G.

Significance of Nitrates in Drinking Water, (In Russian),
W77-03541 5B

KOLINSKA-MALINKA, K.

Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function,
W77-03315 2G

KORDONETS, V. Y.

Experimental Substantiation of the Maximal Permissible Concentrations of Triethanolamine, Ammonium and Calcium Salts of Alkylbenzosulfates in Water Bodies, (In Russian),
W77-03586 5B

KORNIYENKO, YE. YE.

Artificial Modification of Atmospheric Processes,
W77-03303 3B

KOVACS, A.

Dynamics of Near-Shore Ice,
W77-03268 2C

KOWALIK, P.

Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function,
W77-03315 2G

AUTHOR INDEX

LIVSHITS, L. L.

- KREITMAN, A.**
Water Management and Regulation of Water Use, W77-03525 6B
- KROMREY, G.**
Distribution and Feeding of Pumpkinseed (*Lepomis gibbosus*) and Black Crappie (*Pomoxis nigromaculatus*) in a power plant cooling lake, W77-03078 5C
- KRUG, W. R.**
Probable Maximum Flood at Lake Chippewa near Winter, Wisconsin, W77-03349 4A
- KUEHN, W.**
Investigations on the Importance of the Organic Chloro-Compounds and their Adsorbability (Untersuchungen Zur Bedeutung der Organischen Chlorverbindungen und Ihrer Adsorbierbarkeit), W77-03465 5A
- KUKLINA, M. N.**
Hygienic Standardization of the Content in Water of Monoisobutylamine and Diisobutylamine During their Combined Action, (In Russian), W77-03481 5B
- KURISU, F. M.**
Simulation of Pesticide Movement on Small Agricultural Watersheds, W77-03540 5B
- LACASSE, S. M.**
Undrained Behavior of Embankments on New Liskeard Varved Clay, W77-03108 8D
- LACAZE, J. C.**
Influence of Illumination on Phytotoxicity of Crude Oil, W77-03193 5C
- LACHENBRUCH, A.**
Offshore Permafrost Studies, Beaufort Sea, W77-03249 2L
- LACY, W. J.**
Minimizing the Waste Discharges from Water Treatment Plants, W77-03455 5D
- LADD, C. C.**
Undrained Behavior of Embankments on New Liskeard Varved Clay, W77-03108 8D
- LAEVASTU, T.**
Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska, W77-03235 5B
- LAFLEUR, P.**
Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A
- LAGREGA, M.**
Flow Equalization by Use of Aeration Tank Volume, W77-03446 5D
- LAHR, J. C.**
Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L
- LAKE, J. E.**
Environmental Impact of Land Use on Water Quality, Progress Report, W77-03106 5G
- LANDRETH, R. E.**
Degradation Mechanisms: Controlling the Bioaccumulation of Hazardous Materials, W77-03391 5B
- LANGBEIN, W. B.**
Hydrology and Environmental Aspects of Erie Canal (1817-99), W77-03334 8B
- LANKFORD, J.**
Strength of Ice Under Multiaxial Loading, W77-03301 2C
- LARSEN, D. P.**
Lake Phosphorus Loading Graphs: An Alternative, W77-03377 5C
- LARSON, S. P.**
Supplement to Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow, W77-03329 2F
- LAW, Y. M. C.**
Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*, W77-03184 5C
- LAWRENCE, A. W.**
Design and Control of Nitrifying Activated Sludge Systems, W77-03426 5D
- LAZYUK, G. I.**
Significance of Nitrates in Drinking Water, (In Russian), W77-03541 5B
- LE ROUX, P. J.**
Afforestation in Low Rainfall Areas, W77-03139 4D
- LEAHY, P. P.**
Hydraulic Characteristics of the Piney Point Aquifer and Overlying Confining Bed Near Dover, Delaware, W77-03331 2F
- LEBER, B. P. JR.**
An Economic Evaluation of Deep Tank Aeration for Wastewater Treatment, W77-03580 5D
- LEE, E. J.**
Investigation of Oxygen Transfer to Slime as a Surface Reaction, W77-03476 5B
- LEE, J. C.**
Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water, W77-03474 5A
- LEE, K. N.**
Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I, W77-03288 6E
- LEE, S. F.**
Model Studies in Aqueous Chlorination: The Chlorination of Phenols in Dilute Aqueous Solutions, W77-03458 5A
- LEESER, G. W.**
Reactions of Heavy Metals With Soils With Special Regard to Their Application in Sewage Wastes, W77-03359 5B
- LESCHBER, E. W.**
Advanced Trickling Filter for Wastewater Treatment, W77-03365 5D
- LETT, P. F.**
Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (*Salmo gairdneri*), W77-03203 5C
- LEVEY, R. A.**
Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B
- LEWELLAN, R. I.**
The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C
- LEWELLEN, R.**
A Study of Beaufort Sea Coastal Erosion - Northern Alaska, W77-03266 2L
- LEWIS, M.**
Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D
- LEWIS, M. J.**
The Application of the Foam Fractionation Process to the Removal of Viruses. Part I. The Production of a Mathematical Model to Predict the Efficiency of Virus Removal, W77-03433 5D
- LIEBMAN, J.**
Application of a Model for Layout and Design of Sewer Systems, W77-03133 5B
- LINSTEDT, K. D.**
Research Needs for the Potable Reuse of Municipal Wastewater, W77-03356 5D
- LIPPERT, T.**
System for Dewatering Dilute Slurries, W77-03352 5D
- LITTLE, H.**
Inhibiting Nitrification in Wastewater Treatment Plants, W77-03573 5D
- LIU, P. L-F.**
Effects of a Breakwater on Nearshore Currents Due to Breaking Waves, W77-03297 8B
- LIVSHITS, L. L.**
Significance of Nitrates in Drinking Water, (In Russian), W77-03541 5B

AUTHOR INDEX

LOCKHAR, W. L.

LOCKHAR, W. L.
Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*), W77-03204 5C

LOGUDA, A. A.
Sanitary-Bacteriological Study of the Effectiveness of Decontaminating the Sewage of Voroshilovgrad on Sewage Farms, (In Russian), W77-03128 5D

LOGUE, J.
Coming Showdown: Ocean Nationalism and the Senate 200-Mile Shelf Bill, W77-03591 6E

LOLLINI, M. N.
Decontamination of Water Contaminated with Polycyclic Aromatic Hydrocarbons (PAH). I. Action of Chlorine and Ozone on PAH Dissolved in Doubly Distilled and in De-Ionized Water, W77-03369 5D

LONG, L. W.
Shelters Boost Winter Treatment Efficiencies, W77-03432 5D

LONGSDORF, L. L.
Guidelines for Flash Flood and Small Tributary Flood Prediction, W77-03114 4A

LOVELL, C. C.
Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary, W77-03212 3B

LUCKETT, J. K.
The Response of Natural Channels to Urbanization: Two Case Studies from Southeast England, W77-03314 4C

LUEPKE, G.
Heavy-Mineral Trends in the Beaufort Sea, W77-03254 2L

LUSCINSKA, M.
The Primary Production of the Periphyton Association Oedogonio-Epithemietum Litorale, W77-03374 5C

LUTHIN, J. N.
A Three-Dimensional Finite Element Ground Water Model, W77-03109 2F

LYERLY, G. A.
Ammonia Removal from Wastewater by Ligand Exchange, W77-03367 5D

MACDONALD, J. B.
Water Rights, W77-03599 6E

MACDONALD, S.
Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*, W77-03184 5C

MACK, P. J.
Grant Aid for Plant Operations: An Evaluation, W77-03483 5G

MAGLIO, M. A. JR.
Sludge Dewatering Pilot Plant Design, Part I, W77-03416 5D

MAHMOOD, K.
Computer Programs for Sediment Transport, Documentation and Listing, W77-03298 2J

MAJGANI, P.
Effluent Variability Estimation for Complete-Mix Activated Sludge Treatment Systems, W77-03434 5D

MANN, K. H.
Destructive Grazing of Kelp by Sea Urchins in Eastern Canada, W77-03199 5C

MARINER, R. H.
Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California, W77-03342 2K

MARS, P.
Activated Carbon From Activated Sludge, W77-03425 5D

MARTIN, S.
The Interaction of Oil with Sea Ice in the Arctic Ocean, W77-03267 5C

MARTS, M. E.
Electric Power Development in the Pacific Northwest Region: Institutional Commitments and Alternatives, Phase I, W77-03288 6E

MATISOFF, G.
A Model for the Control of Dissolved Manganese in the Interstitial Waters of Chesapeake Bay, W77-03556 5B

MATSCH, L. C.
Effect of High Dissolved Oxygen Concentration in Activated Sludge Systems, W77-03571 5D

MAXEY, F. P.
The Impact of Intensive Application of Pesticides and Fertilizers on Underground Water Recharge Areas which May Contribute to Drinking Water Problems, W77-03567 5B

MAY, J. T.
Multiple Use in the Southern Coastal Plains in the United States, W77-03173 4C

MAY, W. E.
Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons, W77-03219 5A

MAYS, L. W.
Application of a Model for Layout and Design of Sewer Systems, W77-03133 5B

MCALLISTER, J. E.
Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower, W77-03135 3F

MCCAIN, B. B.
Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea, W77-03226 5B

MCCARTHY, P.
The Effect of Oil Pollution in Bantry Bay, W77-03194 5C

MCCAULEY, G. N.
Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D

MCCONNELL, J. B.
Data on Selected Lakes in Washington, Part 5, W77-03350 7C

MCDONALD, J. E.
An Evaluation of Selected Instruments used to Measure the Moisture Content of Hardened Concrete, W77-03295 8F

MCIVER, J. D.
The Application of the Foam Fractionation Process to the Removal of Viruses. Part I. The Production of a Mathematical Model to Predict the Efficiency of Virus Removal, W77-03433 5D

MCKEON, J. B.
Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A

MCKIM, H.
The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

MCKINLEY, K. R.
Investigations on the Role of Dissolved Organic Matter in Determining Ecosystem Structure and Function: The Plankton and Photoheterotrophy, W77-03389 5C

MCLEAN, E. O.
Soil Potassium Relationships as Indicated by Solution Equilibria and Plant Uptake, W77-03395 2G

MEI, C. C.
Effects of a Breakwater on Nearshore Currents Due to Breaking Waves, W77-03297 8B

MERCIER, H. T.
Lake Phosphorus Loading Graphs: An Alternative, W77-03377 5C

MERCKEL, C.
Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota, W77-03094 5C

MERRILL, M. S.
Oxygen and Air Activated Sludge: Another View, W77-03444 5D

MERRY, C.
The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C

METNER, D.
Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*), W77-03204 5C

AUTHOR INDEX

ORELLANA, E.

- MEYERS, H.**
A Historical Summary of Earthquake Epicenters in and Near Alaska, W77-03265 7C
- MILLARD, R. C.**
Current Structure and Mixing in the Shelf/Slope Water Front South of New England, W77-03087 2L
- MILLARD, R. C. JR.**
The Bottom Boundary Layer of the Deep Ocean, W77-03089 2L
- MIRMOVICH, L. A.**
Artificial Modification of Atmospheric Processes, W77-03303 3B
- MISSIMER, T. M.**
High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida, W77-03344 7B
- MISSINGHAM, G. A.**
Monitoring of Community Water Supplies, W77-03463 5A
- MOHAMMED, M. A.**
Effect of Drought Stress Frequencies at Different Growth Stages on Corn Yield, W77-03143 3F
- MOISEEV, S. N.**
Earth and Rock-Fill Dams: Basis of Their Design and Construction, Second Edition, W77-03102 8D
- MOLL, D. B.**
Recent Developments in the Use of Polyelectrolytes, W77-03569 5D
- MOLNIA, B. F.**
Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska, W77-03258 2L
- Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska, W77-03259 2L
- MONARCA, S.**
Decontamination of Water Contaminated with Polycyclic Aromatic Hydrocarbons (PAH). I. Action of Chlorine and Ozone on PAH Dissolved in Doubly Distilled and in De-Ionized Water, W77-03369 5D
- MONKMEYER, P. L.**
A Perturbation Approach to Two-Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03151 4A
- Two Dimensional Bottom Withdrawal from a Density-Stratified Reservoir, W77-03129 4A
- MONTGOMERY, J. M.**
Idaho Environmental Overview, W77-03557 6G
- MOORE, L. J.**
Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp, W77-03186 5C
- MORGAN, D. O.**
Flood Disaster Protection Act of 1973, W77-03522 6F
- MORGAN, G. M. JR.**
A Review of Hail-Measuring Instruments, W77-03101 2B
- MORITA, R. Y.**
Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C
- MORLEY, C. G.**
The Legal Framework for Public Participation in Canadian Water Management, W77-03543 6E
- MORRE, D. J.**
Practical Alternatives to 2,4,5-T for Chemical Control of Brush Along Drainage Ditches and General Watershed Use, W77-03168 5G
- MORRISON, J.**
Environmental Impact of Land Use on Water Quality, Progress Report, W77-03106 5G
- MOSELEY, R. H.**
Heat Inactivation of Poliovirus in Waste Water Sludge, W77-03448 5C
- MUELLER, W. A.**
Sewage Sludge Treatment System, W77-03487 5D
- MUENCH, R. D.**
Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program, W77-03237 5A
- MUNDEN, F. H.**
Rehabilitation of Pamlico Sound Oyster Producing Grounds Damaged or Destroyed by Hurricane Ginger, W77-03562 6B
- MUNN, D. A.**
Soil Potassium Relationships as Indicated by Solution Equilibrations and Plant Uptake, W77-03395 2G
- MURPHY, D. L.**
Seasonal Variation of Residual Drift in Long Island Sound, W77-03322 2L
- MYERS, V. A.**
Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida, W77-03304 2L
- NELSON, R. D.**
Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice, W77-03276 2C
- Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures, W77-03274 2C
- NETZER, A.**
Model Studies in Aqueous Chlorination: The Chlorination of Phenols in Dilute Aqueous Solutions, W77-03458 5A
- NORKIS, C. M.**
Automation: A Short History, But a Long Future, W77-03469 5D
- NOVAK, J. T.**
Characterization and Dewaterability of Water Treatment Plant Residues, W77-03130 5D
- NOVOTNY, V.**
Effluent Variability Estimation for Complete-Mix Activated Sludge Treatment Systems, W77-03434 5D
- NOYE, B. J.**
Wind-Induced Water Level Oscillations in Shallow Lagoons, W77-03287 2H
- NUMMEDAL, D.**
Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska, W77-03245 2L
- NUTBROWN, D. A.**
Normal-Mode Analysis of the Structure of Baseflow Recession Curves, W77-03313 2F
- O'NEIL, E. F.**
An Evaluation of Selected Instruments used to Measure the Moisture Content of Hardened Concrete, W77-03295 8F
- OBERTUEFFER, J. A.**
High Gradient Magnetic Filtration, W77-03418 5D
- ODENS, D.**
Suitability of Lagoon Effluents for Irrigation in South Dakota, W77-03152 5D
- OFFHAUS, K.**
Correlation Between BOD - TOC - TOD (Zusammenhang Zwischen BSE5 - TOC - TOD), W77-03436 5D
- OHASHI, H.**
Cultivation and Breeding of Oenothera-Plant: IV. Effect of Soil Moisture on Growth and Components in Seed of O. Biennis, (In Japanese), W77-03148 2I
- OLIVE, P.**
Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French), W77-03144 5C
- OLIVER, B. G.**
Ultraviolet Disinfection: An Alternative to Chlorination, W77-03445 5D
- OLSEN, R. H.**
A Study of the Suspended Particulate Problem in the Duwamish Basin, W77-03291 5A
- ORELLANA, E.**
Phytoplankton Ecology in Valparaiso Bay: III. Phytoplankton from 1972-73, (In Spanish), W77-03200 5C

AUTHOR INDEX

ORF, T. E.

ORF, T. E.

The Wyoming Water Quality Act and the Federal Water Pollution Control Act Amendments of 1972: A Comparison, W77-03600 5G

ORLOV, K. YA.

Artificial Modification of Atmospheric Processes, W77-03303 3B

OSBORNE, R. H.

Relationships Between Sand Input from Rivers and the Composition of Sands from the Beaches of Southern California, W77-03324 2L

OSTERKAMP, T. E.

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models, W77-03261 5B

OSTROWSKI, J. T.

Behavior of Ground Water Subject to Irrigation of Effluent - A Case Study, W77-03158 5D

OTIS, R. J.

Intermittent Sand Filtration of Household Wastewater, W77-03452 5D

OVERTON, J.

Determining the Most Profitable Nitrogen Fertilization for Corn Production, W77-03172 3F

PAGE, R. A.

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska, W77-03257 2L

PAHREN, R. R.

Rapid Detection of Bacterial Endotoxins in Drinking Water and Renovated Waste Water, W77-03474 5A

PALMER, M. D.

Coastal Region Residence Time Estimates from Concentration Gradients, W77-03093 5C

PALMER, S. L.

Calibration of a Thermal Enrichment Model for Shallow, Barricaded Estuaries, W77-03171 5B

PAPARO, A. A.

Effects of Potassium on Adult Asiatic Clams, *Corbicula Manilensis*, W77-03119 5C

PAREDES, M.

Supernatant Decanting of Aerobically Digested Waste Activated Sludge, W77-03450 5D

PARKER, D. S.

Oxygen and Air Activated Sludge: Another View, W77-03444 5D

PARKS, W. L.

Determining the Most Profitable Nitrogen Fertilization for Corn Production, W77-03172 3F

PARTRIDGE, P. W.

Quadratic Finite Elements in Shallow Water Problems, W77-03083 8B

PASADENA, S.

Sewage Sludge Treatment System, W77-03487 5D

PASE, J. L.

Delaware 1975 State Water Quality Inventory, W77-03378 5G

PASKAUSKY, D. F.

Seasonal Variation of Residual Drift in Long Island Sound, W77-03322 2L

PASTOROK, R. A.

Response of *Daphnia* Population Size and Age Structure to Predation, W77-03390 2H

PATERSON, K. W.

Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens, W77-03590 6G

PAUL, A. J.

Macoma Balthica: An Indicator of Oil Pollution, W77-03185 5A

PECHLANER, R.

Eutrophication and Restoration of Lakes Receiving Nutrients from Diffuse Sources Only, W77-03536 5C

PELLETIER, J. P.

Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French), W77-03144 5C

PELTIER, L.

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D

PERRY, E. B.

Piping in Earth Dams Constructed of Dispersive Clay: Literature Review and Design of Laboratory Tests, W77-03112 8D

PERRY, R.

Effect of Water Chlorination Upon Levels of Some Polynuclear Aromatic Hydrocarbons in Water, W77-03459 5F

PICKERING, R. J.

Measurement of 'Turbidity' and Related Characteristics of Natural Waters, W77-03339 7B

PINHEY, T. K.

Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens, W77-03590 6G

PIZARRO, D. R.

Dynamic Response of Final Settling Tanks to Transient Loading Conditions, W77-03156 5D

PLEDGER, W. R.

Fluidized Waste Incinerator and Method, W77-03489 5D

PONCE, V. M.

Computer Programs for Sediment Transport, Documentation and Listing, W77-03298 2J

POTAPOVA, A. D.

The Regulation of Transpiration Expenditure of Moisture by Plants with the Aid of Antitranspirants, (In Russian), W77-03475 3B

PRESSER, T. S.

Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California, W77-03342 2K

PRESTON, J. R.

The Cost of Producing Effluents to Varying Standards by Biological Treatment Techniques, W77-03568 5D

PROBERT, M. E.

The Composition of Rainwater at Two Sites Near Townsville, Qld. (Australia), W77-03279 2K

PROZESKY, O. W.

Behaviour in Conventional Sewage Purification Processes of Coliform Bacteria with Transferable or Non-Transferable Drug-Resistance, W77-03435 5D

PRUGH, B. J. JR.

Depth and Frequency of Floods in Illinois, W77-03346 2E

PUGNER, P. E.

User Oriented Systems Analysis for Regional Municipal Water Supply Planning, W77-03159 6A

PULLIN, J.

Flotation for Water and Wastewater Treatment, W77-03576 5D

PULPAN, H.

Seismic and Volcanic Risk Studies - Western Gulf of Alaska, W77-03260 2L

QUIGLEY, R. J.

Local Water Systems are Frequently Neglected, W77-03121 6B

RANDALL, C. W.

A Butane Freezing Process for Dewatering Sludge, W77-03153 5D

RANEY, D. C.

Landslide Generated Water Wave Model, W77-03318 8B

RAYNOR, G. S.

Aerosol Production by Irrigation Equipment Used for Land Application of Waste Water, W77-03484 5A

REE, V.

Litter and Oil on the Shores of Utsira, Rogaland County, During Autumn 1974, (In Danish), W77-03125 5B

REED, E. B.

Limnological Characteristics of Strip Mine Ponds in Northwestern Colorado, U.S.A., W77-03538 5C

REEVES, H. E.

Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D

- REEVES, R. D.**
Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968 - January 1975, W77-03343 5A
- REICOSKY, D. C.**
Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil-Matrix Potential and Microclimate, W77-03394 3F
- REID, B. H.**
Chlorine Disinfection of Treated Wastewater in a Baffled Contact Chamber at Less Than 1 C, W77-03363 5D
- REID, R. O.**
Salinity Induced Horizontal Estuarine Circulation, W77-03312 2L
- REIMNITZ, E.**
Distribution and Character of Icings in Northeastern Alaska, W77-03252 2C
A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs, W77-03253 5B
Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions, W77-03250 2L
- REYNOLDS, R. M.**
Near-Shore Atmospheric Modification, W77-03242 5B
- RHEE, J. K.**
Experimental Studies on the Second Intermediate Hosts of *Clonorchis sinensis*: III. Observations on the Relationship Between Clavate Cells of Epidermis and Infectivity of Metacercariae of *Clonorchis sinensis* in Freshwater Fish, (In Korean), W77-03161 5C
- RICE, R. C.**
Virus and Bacterial Removal from Waste Water by Land Treatment, W77-03447 5D
- RICE, R. M.**
Relationships Between Sand Input from Rivers and the Composition of Sands from the Beaches of Southern California, W77-03324 2L
- RICHARDSON, C. J.**
The Effects of Sewage Effluent on Wetland Ecosystems, W77-03354 5C
- RICHMAN, S.**
Seasonal Interactions Among Estuarine Primary Producers and Herbivores, W77-03387 2L
- RILEY, J. P.**
Low Flow Modeling in Small Steep Watersheds, W77-03316 4D
- RITTER, W. F.**
Treatment of Livestock Wastes by a Barrierc Landscape Water Renovation System, W77-03116 5D
- RODGERS, B. A.**
Calibration of a Thermal Enrichment Model for Shallow, Barricaded Estuaries, W77-03171 5B
- ROGERS, C. J.**
Degradation Mechanisms: Controlling the Bioaccumulation of Hazardous Materials, W77-03391 5B
- ROGERS, J. C.**
Beaufort Seacoast Permafrost Studies, W77-03262 2C
- ROGERS, R. H.**
Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A
- ROMANENKO, V. D.**
Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in *Anodonta cygnea*, (In Russian), W77-03366 5C
- ROONEY, J. G.**
Summary of Geology and Ground-Water Resources of Passaic County, New Jersey, W77-03345 4B
- ROYER, T. C.**
Mesoscale Currents and Water Masses in the Gulf of Alaska, W77-03236 5B
- RUSSELL, J. S.**
Effect of Water Stress on the Phasic Development of Annual Medicago Species, W77-03136 2I
- RYDING, S.-O.**
Nature Preservation Activity RR Investigation: Part 6. A Modified Method of Measuring the Chemical Oxygen Demand Gives a High Analytical Capacity, (In Swedish), W77-03589 5A
- SACKINGER, W. M.**
Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice, W77-03276 2C
Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures, W77-03274 2C
- SADANA, A.**
An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D
- SALANKI, J.**
Mussel Test for Biological Control of Water Pollution (Kagyo-teszt vizsennyezesek biologiai hatasanak vizsgalatara), W77-03454 5A
- SANTOYO, H.**
Plankton of Coastal Lagoons: XI. Transport in Three Estuaries of the Northwest of Mexico (November, 1973) (In Spanish), W77-03145 2L
- SAUER, D. K.**
Intermittent Sand Filtration of Household Wastewater, W77-03452 5D
- SAUNDER, B. C.**
The State of Utah Water - 1975, W77-03559 6B
- SAVINO, A.**
Decontamination of Water Contaminated with Polycyclic Aromatic Hydrocarbons (PAH). I. Action of Chlorine and Ozone on PAH Dissolved in Doubly Distilled and in De-Ionized Water, W77-03369 5D
- SCHELSKE, C. L.**
Phytoplankton Response to Phosphorus and Silica Enrichments in Lake Michigan, W77-03537 5C
- SCHENK, J. E.**
Aquatic Field Survey at Iowa Army Ammunition Plant, W77-03386 5C
- SCHMIDT, W. E.**
Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois, W77-03565 5A
- SCHMIDT, B.**
Bear River Evaluation Report, 1974 Survey, W77-03292 5B
- SCHMITZ, W. J. JR.**
Eddy Kinetic Energy in the Deep Western North Atlantic, W77-03088 2L
- SCHUMACHER, J. D.**
Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B
Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G
- SCHWARTZ, R. K.**
Nature and Genesis of Some Storm Washover Deposits, W77-03293 2L
- SEARBY, H. W.**
Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas, W77-03239 5B
Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases, W77-03240 5B
- SELLMAN, P. V.**
Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea, W77-03247 2C
- SELLMANN, P. V.**
The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska, W77-03296 2C
- SEN, Z.**
Wet and Dry Periods of Annual Flow Series, W77-03319 2E
- SFORZOLINI, G. S.**
Decontamination of Water Contaminated with Polycyclic Aromatic Hydrocarbons (PAH). I. Action of Chlorine and Ozone on PAH Dissolved in Doubly Distilled and in De-Ionized Water, W77-03369 5D
- SHAH, N. J.**
Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A

AUTHOR INDEX

SHAH, N. J.

SHAHANE, A. N.

Correlation Analysis of Hydrometeorological Data,
W77-03086 2A

Useful Modeling Concepts for the FCD Water System,
W77-03524 6A

SHAPIRO, L. H.

Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice,
W77-03276 2C

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice,
W77-03271 2L

SHARP, J. V. A.

Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices,
W77-03351 5A

SHAW, D. G.

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf,
W77-03224 5B

Macoma Balthica: An Indicator of Oil Pollution,
W77-03185 5A

SHEA, G.

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio,
W77-03353 5D

SHEPARD, M. R. N.

Laboratory Studies on the Effects of Temperature on Accumulation of Solids in Biological Filters,
W77-03464 5D

SHERARD, J. H.

Elemental Distribution Diagrams for Biological Wastewater Treatment,
W77-03429 5D

SHIFF, H.

Computation of the Potential Evapotranspiration and Their Comparison with Values of the Actual Evapotranspiration of Lysimeters, (In German),
W77-03118 2D

SHIH, G.

Use of Hybrid Computer Model in Resource Planning,
W77-03523 6A

SHIRAZI, G. A.

Calibration of Neutron Probe in Some Selected Hawaiian Soils,
W77-03321 2G

SHKODICH, P. E.

Comparative Assessment of the Effectiveness of Certain Methods Making Industrial Effluents Noncarcinogenic, (In Russian),
W77-03488 5D

SHUVAL, H. I.

Risk of Communicable Disease Infection Associated with Waste Water Irrigation in Agricultural Settlements,
W77-03485 5C

SIDWICK, J. M.

The Cost of Producing Effluents to Varying Standards by Biological Treatment Techniques,
W77-03568 5D

SIMMONS, M. S.

Phytoplankton Response to Phosphorus and Silica Enrichments in Lake Michigan,
W77-03537 5C

SIMON, P. B.

Aquatic Field Survey at Iowa Army Ammunition Plant,
W77-03386 5C

SIMPSON, B. W.

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower,
W77-03135 3F

SISK, M. E.

Biological and Chemical Evaluation of the Aquatic Environment of Selected Undeveloped Kentucky Lake Embayments,
W77-03209 5C

SIWERTZ, E.

Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French),
W77-03144 5C

SKOKYU, N.

Cultivation and Breeding of Oenothera-Plant: IV. Effect of Soil Moisture on Growth and Components in Seed of O. Biennis, (In Japanese),
W77-03148 2I

SLAGLE, S. E.

Ground-Water Resources of Greeley and Wichita Counties, Western Kansas,
W77-03347 4B

SMEDBERG, C. T.

Cyanophage Analysis as a Biological Pollution Indicator-Bacterial and Viral,
W77-03460 5A

SMILES, D. E.

On the Validity of the Theory of Flow in Saturated Swelling Materials,
W77-03280 2G

SMITH, G. B.

Pelagic Tar in the Norwegian Coastal Current,
W77-03190 5B

SMITH, J. G.

Model Studies in Aqueous Chlorination: The Chlorination of Phenols in Dilute Aqueous Solutions,
W77-03458 5A

SMITH, K. V. H.

Experimental Investigation of Flow Over Side Weirs,
W77-03317 8B

SMITH, L. M.

Ammonia Removal from Wastewater by Ligand Exchange,
W77-03367 5D

SMITH, V. E.

Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data,
W77-03305 5A

SOBSEY, M. D.

Field Monitoring Techniques and Data Analysis,
W77-03150 5A

SOLDATOVA, S. S.

Determination of Arsenic in Drinking Water by Means of Silver Diethyldithiocarbamate, (In Russian),
W77-03113 5A

SOLOMATINA, V. D.

Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in Anodonta Cygnea, (In Russian),
W77-03366 5C

SOPPER, W. E.

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method,
W77-03147 5D

SOUTHWORTH, G. R.

Photolysis of 5-Chlorouracil in Natural Waters,
W77-03477 5B

SPARKS, R. E.

Effects of Potassium on Adult Asiatic Clams, Corbicula Manilensis,
W77-03119 5C

Environmental Inventory and Assessment of Navigation Pools 24, 25, and 26, Upper Mississippi and Lower Illinois Rivers; An Electrofishing Survey of the Illinois River,
W77-03302 8I

SPECTOR, M. L.

Removal of BOD and Nitrogenous Pollutants from Wastewaters,
W77-03486 5D

SPEECE, R. E.

Flow Equalization by Use of Aeration Tank Volume,
W77-03446 5D

SPRAGUE, J. B.

Effects of Crude Oil on American Lobster (Homarus Americanus) Larvae in the Laboratory,
W77-03197 5C

STENSLAND, G. J.

Precipitation Chemistry Studies at Lake George: Acid Rains,
W77-03098 5A

STEPHEN, M. F.

Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska,
W77-03245 2L

STEPHENS, N. T.

A Butane Freezing Process for Dewatering Sludge,
W77-03153 5D

STEWART, G. L.

Measurement of Nonexchanging Pores During Miscible Displacement in Soils,
W77-03320 2G

STOKES, W. R.

Ground-Water Quality Data for Georgia,
W77-03333 7C

STONE, J. F.

Evapotranspiration Reduction by Field Geometry Effects,
W77-03169 2D

STORCK, W. J.

Wastewater's Future is Cloudy,
W77-03577 5D

- STOVER, E. L.**
Inhibiting Nitrification in Wastewater Treatment Plants,
W77-03573 5D
- STRINGER, W. J.**
Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing,
W77-03273 2C
Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing,
W77-03272 2C
- STROUD, T. F.**
Ductile Iron Pipe Solves a Tough Sewer Problem at Jimerson Creek,
W77-03398 8G
- SUMMERFELT, R. C.**
Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification,
W77-03208 2H
- SWEENEY, R.**
Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota,
W77-03094 5C
- TAKEDA, N.**
Combined Process of Pyrolysis and Combustion for Sludge Disposal,
W77-03415 5D
- TALSMA, T.**
Infiltration and Water Movement in an in Situ Swelling Soil During Prolonged Ponding,
W77-03281 2G
- TANJI, K. K.**
A Three-Dimensional Finite Element Ground Water Model,
W77-03109 2F
- TANNER, W. F.**
Beach Processes, Perrien County, Michigan,
W77-03095 2J
- TARAPCHAK, S. J.**
The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota,
W77-03375 5B
- TAYLOR, P. S.**
California Water Project: Law and Politics,
W77-03583 6E
- THOMAS, D.**
Correlation Analysis of Hydrometeorological Data,
W77-03086 2A
- THOMAS, J. C.**
Water Stress Induced Alterations of the Stomatal Response to Decreases in Leaf Water Potential,
W77-03140 2I
- THOMAS, W. A.**
Hydrologic Engineering Methods for Water Resources Development, Volume 6, Water Surface Profiles,
W77-03105 8B
- THOMPSON, C. M.**
Effects of Potassium on Adult Asiatic Clams, *Corbicula Manilensis*,
W77-03119 5C
- THOMPSON, R. K.**
Effects of Soil-Moisture Regimes on the Growth of Barley,
W77-03216 3F
- TIKHOMIROV, Y. P.**
Comparative Assessment of the Effectiveness of Certain Methods Making Industrial Effluents Noncarcinogenic, (In Russian),
W77-03488 5D
- TOETZ, D. W.**
Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification,
W77-03208 2H
- TOIMIL, L. J.**
A 'Herring-Bone' Pattern of Possible Taylor-Gorter-Type Flow Origin Seen in Sonographs,
W77-03253 5B
- TOWERY, N. G.**
A Review of Hail-Measuring Instruments,
W77-03101 2B
- TRAMA, F. B.**
Temporal Variations in Tributary Phosphorus Loads,
W77-03123 5B
- TRESCOTT, P. C.**
Supplement to Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow,
W77-03329 2F
- TRIAL, J.**
Effect of Zinc-Coated Culverts on Vertebrate and Invertebrate Fauna in Selected Maine Streams,
W77-03170 5C
- TSAI, V. N.**
Hygienic Substantiation of the Maximum Permissible Concentration of Tin Tributylmethacrylate in Water Bodies, (In Russian),
W77-03107 5A
- TUFFEY, T. J.**
Temporal Variations in Tributary Phosphorus Loads,
W77-03123 5B
- TYLER, P. A.**
Chemistry of Salt Lakes and Other Waters in the Sub-Humid Regions of Tasmania (Australia),
W77-03284 2H
- UDAL'TSOVA, N. I.**
Determination of Arsenic in Drinking Water by Means of Silver Diethyldithiocarbamate, (In Russian),
W77-03113 5A
- UHL, V. W.**
The Occurrence of Groundwater in the Satpura Region of Central India,
W77-03146 4B
- UNTERSTEINER, N.**
Dynamics of Near-Shore Ice (Data Buoys),
W77-03269 2C
- URIDGE, E. S.**
Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower,
W77-03135 3F
- URSIC, S. J.**
Multiple Use in the Southern Coastal Plains in the United States,
W77-03173 4C
- VAN DER LEIJ, A.**
Infiltration and Water Movement in an in Situ Swelling Soil During Prolonged Ponding,
W77-03281 2G
- VAN ES, J. C.**
Local Water Systems are Frequently Neglected,
W77-03121 6B
- VAN VALKENBURG, S. D.**
Seasonal Interactions Among Estuarine Primary Producers and Herbivores,
W77-03387 2L
- VAN ZYL, M.**
Behaviour in Conventional Sewage Purification Processes of Coliform Bacteria with Transferable or Non-Transferable Drug-Resistance,
W77-03435 5D
- VANCE, R. W.**
Scour Around Bridge Piers,
W77-03294 8B
- VANDERHORST, J. R.**
Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp,
W77-03186 5C
- VANWINKLE, W.**
Effect of Temperature and Salinity on Extension of Siphons by *Mercenaria Mercenaria*,
W77-03205 5C
- VASUKI, N. C.**
Delaware 1975 State Water Quality Inventory,
W77-03378 5G
- VILLEDON DE NAIDE, O.**
Influence of Illumination on Phytotoxicity of Crude Oil,
W77-03193 5C
- VILLWOCK, R. M.**
Distribution of Pelagic Zooplankton within a Thermal Gradient in Lake Columbia, a Cooling Lake near Portage, Wisconsin,
W77-03077 5C
- VIRARAGHAVAN, T.**
Groundwater Quality Adjacent to a Septic Tank System,
W77-03456 5D
- VOLLMER, A.**
Comparative Photosynthetic Production of Mojave Desert Shrubs,
W77-03141 2D
- VOLLMER, A. T.**
A Comparison of Seasonal Primary Production of Mojave Desert Shrubs During Wet and Dry Years,
W77-03138 2I
- VOORHIS, A. D.**
Current Structure and Mixing in the Shelf/Slope Water Front South of New England,
W77-03087 2L
- WADDINGTON, J. C. B.**
The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota,
W77-03375 5B

AUTHOR INDEX

WAGAMAN, D.

WAGAMAN, D.
Analytical Studies for Assessing the Impact of
Sanitary Sewage Facilities of Delaware Coun-
ty, Ohio,
W77-03353 5D

WAGNER, R.

A New Method of Automatic Determination of
Nitrate in Waste Waters and Polluted Surface
Waters (Ein Neues Verfahren Zur Auto-
matischen Nitrat-Bestimmung in Abwaessern
und Belasteten Oberflaechenwaessern),
W77-03466 5A

WALKER, H. J.

Breakup Flooding and Nutrient Source of Col-
ville River Delta During 1973,
W77-03388 5B

WALKER, J. D.

A Review of Clustering Techniques with
Emphasis on Benthic Ecology,
W77-03372 5A

WALLACE, A.

Comparative Photosynthetic Production of
Mojave Desert Shrubs,
W77-03141 2D

WALLACE, R. N.

Factors Affecting Powdered Carbon Treatment
of a Municipal Wastewater,
W77-03430 5D

WALLIS, C.

Virus and Bacterial Removal from Waste
Water by Land Treatment,
W77-03447 5D

WALSH, P. J.

Wind-Induced Water Level Oscillations in
Shallow Lagoons,
W77-03287 2H

WALTER, B.

Near-Shore Atmospheric Modification,
W77-03242 5B

WALTON, R. G.

Electric Power Development in the Pacific
Northwest Region: Institutional Commitments
and Alternatives, Phase I,
W77-03288 6E

WARD, R. L.

Heat Inactivation of Poliovirus in Waste Water
Sludge,
W77-03448 5C

WARNOCK, R. G.

Groundwater Quality Adjacent to a Septic
Tank System,
W77-03456 5D

WATANABE, I.

Cultivation and Breeding of Oenothera-Plant:
IV. Effect of Soil Moisture on Growth and
Components in Seed of O. Biennis, (In
Japanese),
W77-03148 2I

WATSON, S. B.

OPTRM - A Hydrologic Transport Model With
Parameter Optimization,
W77-03115 5B

WEAKLY, E. C.

Ground-Water Resources of Greeley and
Wichita Counties, Western Kansas,
W77-03347 4B

WEBB, D. C.

Current Structure and Mixing in the
Shelf/Slope Water Front South of New En-
gland,
W77-03087 2L

WEEKS, M. E.

Measurement of Nonexchanging Pores During
Miscible Displacement in Soils,
W77-03320 2G

WEEKS, O. L.

Measurement of Nonexchanging Pores During
Miscible Displacement in Soils,
W77-03320 2G

WEEKS, W. F.

Dynamics of Near-Shore Ice,
W77-03268 2C

WEITZEL, R. L.

Aquatic Field Survey at Iowa Army Ammu-
nition Plant,
W77-03386 5C

WELLINGS, R. A.

Effect of Water Chlorination Upon Levels of
Some Polynuclear Aromatic Hydrocarbons in
Water,
W77-03459 5F

WELLINGS, S. R.

Incidence of Pathology of Marine Fish Dis-
eases in the Gulf of Alaska, Bering Sea, and
Beaufort Sea,
W77-03226 5B

WELLS, F. G.

Effects of Crude Oil on American Lobster
(Homarus Americanus) Larvae in the Labora-
tory,
W77-03197 5C

WENG, C-N.

Biochemical Mechanisms in the Methane Fer-
mentation of Glutamic and Oleic Acids,
W77-03441 5D

WENZEL, H. G. JR.

Application of a Model for Layout and Design
of Sewer Systems,
W77-03133 5B

WESTPHAL, J. A.

Water Quality Simulation of Tahoe-Truckee
System, Nevada-California - Volume II - Ap-
pendices,
W77-03351 5A

WHELAN, P. M.

Effects of Oil on Beaches in West Cork, Ire-
land,
W77-03192 5C

WHILLANS, I. M.

Radio-Echo Layers and the Recent Stability of
the West Antarctic Ice Sheet,
W77-03100 2C

WHITE, J. B.

Experiments on Wastewater Sedimentation,
W77-03574 5D

WHITE, N. D.

Maps Showing Ground-Water Conditions in the
San Simon Area, Cochise and Graham Coun-
ties, Arizona, and in Hidalgo County, New
Mexico-1975,
W77-03327 7C

WHITTLESEY, N. K.

A Computer Program for Estimating Costs of
Owning and Operating an Irrigation Well Under
Conditions of Declining Water Levels,
W77-03211 6C

WILES, D. R.

Molecular Activation Analysis and Its Applica-
tion to Methylmercury Determination in Vari-
ous Marine Samples,
W77-03202 5A

WILHM, J. L.

Physiochemical and Biological Conditions in
Two Oklahoma Reservoirs Undergoing Arti-
ficial Destratification,
W77-03208 2H

WILLIAMS, W. D.

Chemical Composition of Some Inland Surface
Waters in South, Western, and Northern Aus-
tralia,
W77-03286 2K

Stability of Ionic Proportions in Five Salt
Lakes in Victoria, Australia,
W77-03285 2H

WILLIS, D. L.

Innovations in Sewer Design and Construction,
W77-03399 8G

WILSON, F.

The Rotating Biological Filter,
W77-03282 5D

WILSON, R. P.

Maps Showing Ground-Water Conditions in the
San Bernardino Valley Area Cochise County,
Arizona-1975,
W77-03328 7C

Maps Showing Ground-Water Conditions in the
San Simon Area, Cochise and Graham Coun-
ties, Arizona, and in Hidalgo County, New
Mexico-1975,
W77-03327 7C

WINBURN, H. J.

Liming Farmland with Calcium Sludge,
W77-03163 5D

WINGERT, A. L.

A Study of the Suspended Particulate Problem
in the Duwamish Basin,
W77-03291 5A

WINNICKI, R.

A Study of Mixing Characteristics of Sewage
Stabilization Ponds with Radioactive Tracers,
W77-03461 5D

WINSLOW, S. A.

The Relationship of Bottom Sediments to Bac-
terial Water Quality in a Recreational
Swimming Area,
W77-03167 5B

WIXSON, B. G.

A Study on the Application of Biogrowth
Sheets to Improve Lagoon Effluent Quality,
W77-03162 5D

WOLF, R. J.

Buried Aquifers in the Brooten-Belgrade and
Lake Emily Areas, West-Central Minnesota-
Factors Related to Developing Water for Irriga-
tion,
W77-03335 4B

ORGANIZATIONAL INDEX AUTHOR INDEX

ZYABBAROVA, S. A.

- WONG, C. S.**
Distribution and Source of Tar on the Pacific Ocean,
W77-03191 5B
- WOOD, R.**
Keep Cool with Sewage Effluent - A Two-Way Saving of Water,
W77-03578 3E
- WOODWARD, R. L.**
Innovation is an Old Idea--With A Big Future,
W77-03482 5D
- WRIGHT, P.**
A Cine-Camera Technique for Process Measurement on a Ridge and Runnel Beach,
W77-03325 2L
- WRIGHT, R. F.**
The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota,
W77-03375 5B
- WYETH, R.**
Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota,
W77-03094 5C
- YAMAMOTO, T.**
Hydrodynamic Forces on Multiple Circular Cylinders,
W77-03081 8B
- YANG, C. T.**
Minimum Unit Stream Power and Fluvial Hydraulics,
W77-03080 8B
- YEARSLEY, J.**
Evaluation of Lake Milner Water Quality Model,
W77-03373 5B
- YOPP, J. H.**
Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois,
W77-03565 5A
- YOUNG, J. C.**
The Electrolytic Respirometer - I. Factors Affecting Oxygen Uptake Measurements,
W77-03457 5A
- ZANDER, E. H.**
Effect of High Dissolved Oxygen Concentration in Activated Sludge Systems,
W77-03571 5D
- ZARADNY, H.**
Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function,
W77-03315 2G
- ZELDIN, M.**
Corps' New Look in Flood Control: No Dams, Levees,
W77-03593 4A
- ZEMBRZUSKI, T. J. JR.**
Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York,
W77-03337 4A
- ZHUKOV, D. D.**
Biological Treatment of Sewage Waters - Device with Internal Aeration Zone,
W77-03404 5D
- ZOGORSKI, J. S.**
The Kinetics of Adsorption of Phenols by Granular Activated Carbon,
W77-03149 5D
- ZYABBAROVA, S. A.**
Hygienic Standardization of the Content in Water of Monoisobutylamine and Diisobutylamine During their Combined Action, (In Russian),
W77-03481 5B

ORGANIZATIONAL INDEX

ACADEMY OF MUNICIPAL ECONOMY, MOSCOW (USSR). RESEARCH INST. OF PUBLIC WATER SUPPLY, WATER PURIFICATION.

Determination of Arsenic in Drinking Water by Means of Silver Diethyldithiocarbamate, (In Russian),
W77-03113 5A

ADELAIDE UNIV., (AUSTRALIA). DEPT. OF APPLIED MATHEMATICS.

Wind-Induced Water Level Oscillations in Shallow Lagoons,
W77-03287 2H

ADELAIDE UNIV. (AUSTRALIA). DEPT. OF ZOOLOGY.

Stability of Ionic Proportions in Five Salt Lakes in Victoria, Australia,
W77-03285 2H

Chemical Composition of Some Inland Surface Waters in South, Western, and Northern Australia,
W77-03286 2K

ADI, LTD., FREDERICTON (NEW BRUNSWICK).

Groundwater Quality Adjacent to a Septic Tank System,
W77-03456 5D

AGARMETEOROLOGISCHE FORSCHUNGSANSTALT, BRUNSWICK (WEST GERMANY).

Computation of the Potential Evapotranspiration and Their Comparison with Values of the Actual Evapotranspiration of Lysimeters, (In German),
W77-03118 2D

AGRICULTURAL RESEARCH SERVICE, FLORENCE, S. C. COASTAL PLAINS SOIL AND WATER CONSERVATION RESEARCH CENTER.

Diurnal Fluctuation of Leaf-Water Potential of Corn as Influenced by Soil Matrix Potential and Microclimate,
W77-03394 3F

AGRICULTURAL RESEARCH SERVICE, MANDAN, N. DAK. NORTHERN GREAT PLAINS RESEARCH CENTER.

Rates of Photosynthesis and Transpiration and Diffusive Resistance of Six Grasses Grown under Controlled Conditions,
W77-03142 2D

AGRICULTURAL RESEARCH SERVICE, PHEONIX, ARIZ. WATER CONSERVATION LAB.

Virus and Bacterial Removal from Waste Water by Land Treatment,
W77-03447 5D

AGRICULTURAL RESEARCH SERVICE, YAKIMA, WASH.

Electronic Sensor for Low-to-Medium Windspeeds,
W77-03099 7B

AHMADU BELLO UNIV., ZARIA (NIGERIA). DEPT. OF CIVIL ENGINEERING.

Exact Solution of Gradually Varied Flow,
W77-03085 8B

AIR PRODUCTS AND CHEMICALS, ALLENTOWN, PA. (ASSIGNEE).

Removal of BOD and Nitrogenous Pollutants from Wastewaters,
W77-03486 5D

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT OKEANOLOGII.

Ecology of Aquatic Saprophytic Phycomycetes. II, (In Russian),
W77-03201 5C

AKADEMIYA NAUK URSR, KIEV. INSTYTUT HIDROBIOLOGII.

Effect of Calcium from the Water Environment on Tissue Metabolism of Phosphates in Anodonta Cygnea, (In Russian),
W77-03366 5C

ALABAMA UNIV., UNIVERSITY. DEPT. OF ENGINEERING MECHANICS.

Landslide Generated Water Wave Model,
W77-03318 8B

ALASKA UNIV., ANCHORAGE. ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER.

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas,
W77-03239 5B

Marine Climatology of the Gulf of Alaska and the Bering and Beaufort Seas. Part III. Climatic Atlases,
W77-03240 5B

ALASKA UNIV., COLLEGE. DEPT. OF GEOLOGY.

The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain,
W77-03246 2L

ALASKA UNIV., COLLEGE. DEPT. OF HISTORY.

Beaufort Sea, Chukchi Sea, Bering Strait Historical Baseline Ice Study,
W77-03275 2C

ALASKA UNIV., COLLEGE. GEOPHYSICAL INST.

Seismic and Volcanic Risk Studies - Western Gulf of Alaska,
W77-03260 2L

Offshore Permafrost-Drilling, Boundary Conditions, Properties, Processes and Models,
W77-03261 5B

Beaufort Seacoast Permafrost Studies,
W77-03262 2C

Mechanics of Origin of Pressure Ridges, Shear Ridges and Hummock Fields in Landfast Ice,
W77-03271 2L

Development of Hardware and Procedures for In-Situ Measurement of Creep in Sea Ice,
W77-03276 2C

Operation of an Alaskan Facility for Applications of Remote-Sensing Data to OCS Studies,
W77-03277 7B

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.

Macoma Balthica: An Indicator of Oil Pollution,
W77-03185 5A

Natural Distribution of Trace Heavy Metals and Environmental Background in Three Alaska Shelf Areas,
W77-03222 5B

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf,
W77-03224 5B

Microbial Release of Soluble Trace Metals from Oil Impacted Sediments,
W77-03225 5C

Mesoscale Currents and Water Masses in the Gulf of Alaska,
W77-03236 5B

Historical and Statistical Oceanographic Data Analysis and Ship of Opportunity Program,
W77-03237 5A

Benthos-Sedimentary Substrate Interactions,
W77-03263 5C

ALASKA UNIV., COLLEGE. INST. OF WATER RESOURCES.

Effects of Seasonability and Variability of Streamflow on Nearshore Coastal Areas,
W77-03229 5C

ALASKA UNIV., COLLEGE. OCS COORDINATION OFFICE.

Morphology of Bering Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing,
W77-03272 2C

Morphology of Beaufort Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing,
W77-03273 2C

Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures,
W77-03274 2C

ALEXANDRIA UNIV. (EGYPT). DEPT. OF SOIL AND WATER SCIENCE; AND TANTA UNIV. (EGYPT). DEPT. OF SOIL AND WATER SCIENCE.

Effect of Drought Stress Frequencies at Different Growth Stages on Corn Yield,
W77-03143 3F

ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT, FORT WAYNE, IND.

Environmental Impact of Land Use on Water Quality, Progress Report,
W77-03106 5G

ANDERSON-NICHOLS AND CO., INC., BOSTON, MASS.

Shelters Boost Winter Treatment Efficiencies,
W77-03432 5D

ARGONNE NATIONAL LAB., ILL.

Environmental Status of the Lake Michigan Region. Vol. 17. Inland Fishes of the Lake Michigan Drainage Basin,
W77-03566 6G

ARIZONA BUREAU OF MINES, TUCSON.

Utilization of Municipal Waste Water for Froth Flotation of Copper and Molybdenum Sulfides,
W77-03132 5D

ARIZONA UNIV., TUCSON. DEPT. OF AGRONOMY AND PLANT GENETICS.

Effects of Soil-Moisture Regimes on the Growth of Barley,
W77-03216 3F

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.

The Occurrence of Groundwater in the Satpura Region of Central India,
W77-03146 4B

ORGANIZATIONAL INDEX

ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.

ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.
Soil Moisture Distribution Under Wide-Bed, Narrow-Row, and Conventional-Row Cotton, W77-03137 3F

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
The Relationship of Bottom Sediments to Bacterial Water Quality in a Recreational Swimming Area, W77-03167 5B

ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.
Plastic-Reinforced Asphalt Seepage Barrier, W77-03120 3B
1973 Western State Conference on Water Information Dissemination, W77-03166 10C

ARMY DISTRICT ENGINEERS, HUNTINGTON, W. VA.
Flood Plain Information: Scioto and Olentangy Rivers, Ohio, Columbus Area, Summary Report, W77-03183 4A

ARMY ENGINEER DISTRICT, HUNTINGTON, W. VA.
Flood Plain Information: Tuscarawas and Adjacent Tributary Areas, Tuscarawas County, Ohio, W77-03174 4A

ARMY ENGINEER DISTRICT, LOUISVILLE, KY.
Flood Plain Information: Wildcat Creek and Kokomo Creek, Vicinity of Kokomo, Howard County, Indiana, W77-03182 4A

ARMY ENGINEER DISTRICT, OMAHA, NEBR.
Flood Plain Information: Metropolitan Region, Lincoln, Nebraska: Volume I, Summary Report; Salt Creek, Haines Branch and Beal Slough, Salt Creek Basin, W77-03179 4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume II, Summary Report, Antelope Creek, Dead Mans Run, and Middle Creek, Salt Creek Basin, W77-03180 4A

Flood Plain Information: Metropolitan Region, Lincoln, Nebraska, Volume III, Summary Report, Little Salt, Oak, Salt, and Stevens Creek, Salt Creek Basin, W77-03181 4A

ARMY ENGINEER DISTRICT, SACRAMENTO, CALIF.
Flood Plain Information: San Juan River and Tributaries, Farmington, New Mexico, W77-03176 4A

ARMY ENGINEER DISTRICT, SAVANNAH, GA.
Allatoona Lake, Destratification Equipment Test Report, W77-03306 5G

Allatoona Lake, Destratification Equipment Test, Appendix A, Operational and Water Quality Data, 1968, W77-03307 5G

Allatoona Lake, Destratification Equipment Test, Appendix B, Operational and Water Quality Data, 1969, W77-03308 5G

Allatoona Lake, Destratification Equipment Test, Appendix C, Operational and Water Quality Data, 1970, W77-03309 5G

ARMY ENGINEER DISTRICT, ST. LOUIS, MO.
Flood Plain Information: Kaskaskia River and Tributaries, Coles County, Illinois, W77-03175 4A

ARMY ENGINEER DISTRICT, WALTHAM, MASS. NEW ENGLAND DIV.
Flood Plain Information: Contoocook River and Nubanusit Brook, Peterborough, New Hampshire, W77-03177 4A

Flood Plain Information: Chicopee River: Chicopee, Springfield, Ludlow, Wilbraham and Palmer, Massachusetts, W77-03178 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. CONCRETE LAB.
An Evaluation of Selected Instruments used to Measure the Moisture Content of Hardened Concrete, W77-03295 8F

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. ENVIRONMENTAL EFFECTS LAB.
Water Usage and Wastewater Characterization at a Crops of Engineers Recreation Area, W77-03362 5A

Feasibility of Transplantation, Revegetation, and Restoration of Eelgrass in San Diego Bay, California, W77-03546 5G

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. SOILS AND PAVEMENTS LAB.
Piping in Earth Dams Constructed of Dispersive Clay; Literature Review and Design of Laboratory Tests, W77-03112 8D

ASSOCIATED WATER AND AIR RESOURCES ENGINEERS, INC., NASHVILLE, TENN.
Allatoona Lake, Destratification Equipment Test, Appendix D, Effects of Artificial Destratification on Temperature and Dissolved Oxygen in Allatoona Reservoir, W77-03310 5G

ASTON UNIV., BIRMINGHAM (ENGLAND). DEPT. OF BIOLOGICAL SCIENCES.
Laboratory Studies on the Effects of Temperature on Accumulation of Solids in Biological Filters, W77-03464 5D

BATTELLE PACIFIC NORTHWEST LABS., SEQUIM, WASH. MARINE RESEARCH LABS.
Toxicity of No. 2 Fuel Oil to Coon Stripe Shrimp, W77-03186 5C

BELOUSSIAN SANITARY-HYGIENIC RESEARCH INST., MINSK (USSR).
Significance of Nitrates in Drinking Water, (In Russian), W77-03541 5B

BENDIX AEROSPACE SYSTEMS DIV., ANN ARBOR, MICH.
Computer Mapping of Water Quality in Saginaw Bay with Landsat Digital Data, W77-03305 5A

BIRMINGHAM UNIV., (ENGLAND), DEPT. OF CIVIL ENGINEERING.
A Study of Mixing Characteristics of Sewage Stabilization Ponds with Radioactive Tracers, W77-03461 5D

BLACK AND VEATCH, KANSAS CITY, MO.
Infiltration/Inflow - The Kansas Connection, W77-03479 5G

BOEING CO., SEATTLE, WASH.
A Study of the Suspended Particulate Problem in the Duwamish Basin, W77-03291 5A

BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Aerosol Production by Irrigation Equipment Used for Land Application of Waste Water, W77-03484 5A

BROWN AND CALDWELL, WALNUT CREEK, CALIF.
Oxygen and Air Activated Sludge: Another View, W77-03444 5D

BUCK, SEIFERT AND JOST, ENGLEWOOD CLIFFS, N. J.
Biochemical Mechanisms in the Methane Fermentation of Glutamic and Oleic Acids, W77-03441 5D

CAIRO UNIV., GIZA (EGYPT). DEPT. OF CIVIL ENGINEERING.
Experimental Investigation of Flow Over Side Weirs, W77-03317 8B

CALIFORNIA INST. OF TECH., PASADENA, CALIF. (ASSIGNEE).
Sewage Sludge Treatment System, W77-03487 5D

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Urban Water Use in California, W77-03549 6B

Plan for Improvement of the Delta Levees, W77-03550 4A

The California State Water Project in 1975, W77-03551 6B

Meeting Water Demands in Sacramento County, W77-03553 6D

Ground Water Basin Protection Projects: Fremont Salinity Barrier, W77-03555 4B

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO. DIV. OF PLANNING.
California's Ground Water, W77-03548 4B

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO. WATER USE PROGRAMS.
Vegetative Water Use in California, 1974, W77-03554 3F

CALIFORNIA UNIV., BERKELEY. DEPT. OF ECONOMICS.
California Water Project: Law and Politics, W77-03583 6E

ORGANIZATIONAL INDEX

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY.

CALIFORNIA UNIV., DAVIS.

Incidence of Pathology of Marine Fish Diseases in the Gulf of Alaska, Bering Sea, and Beaufort Sea,
W77-03226 5B

CALIFORNIA UNIV., DAVIS. WATER SCIENCE AND ENGINEERING SECTION.

A Three-Dimensional Finite Element Ground Water Model,
W77-03109 2F

CALIFORNIA UNIV., LOS ANGELES. LAB. OF NUCLEAR MEDICINE AND RADIATION BIOLOGY.

Comparative Photosynthetic Production of Mojave Desert Shrubs,
W77-03141 2D

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ARCHITECTURE AND URBAN PLANNING.

Land Based Sewage Sludge Management Alternatives for Los Angeles: Evaluation and Comparison,
W77-03289 5D

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.

The Transport of Pollutants in Ground Water, (In German),
W77-03131 5B

CAMP, DRESSER AND MCKEE, BOSTON, MASS.

Innovation is an Old Idea--With A Big Future,
W77-03482 5D

CAMP DRESSER AND MCKEE, INC., BOSTON, MASS.

Comparison of Air and Oxygen Activated Sludge Systems,
W77-03443 5D

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).

Ultraviolet Disinfection: An Alternative to Chlorination,
W77-03445 5D

Microbiological Examination of Waters and Effluents,
W77-03470 5A

The Legal Framework for Public Participation in Canadian Water Management,
W77-03543 6E

CAPE TOWN UNIV. (SOUTH AFRICA). DEPT. OF CHEMICAL ENGINEERING.

A Study of Substrate Removal in a Microbial Film Reactor,
W77-03480 5D

CARAIBISCH MARIEN-BIOLOGISCH INSTITUUT, CURACAO (NETHERLANDS, ANTILLES).

Toxicity of Crude Oils and a Dispersant to the Stony Coral *Madraca Mirabilis*,
W77-03196 5C

CARLETON UNIV., OTTAWA (ONTARIO). DEPT. OF CHEMISTRY.

Molecular Activation Analysis and Its Application to Methylmercury Determination in Various Marine Samples,
W77-03202 5A

CARMEL SANITARY DISTRICT, CALIF.

Supernatant Decanting of Aerobically Digested Waste Activated Sludge,
W77-03450 5D

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, WEST PALM BEACH.

Flood Disaster Protection Act of 1973,
W77-03522 6F

Use of Hybrid Computer Model in Resource Planning,
W77-03523 6A

Useful Modeling Concepts for the FCD Water System,
W77-03524 6A

Water Management and Regulation of Water Use,
W77-03525 6B

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, WEST PALM BEACH. ENVIRONMENTAL ENGINEERING.

Correlation Analysis of Hydrometeorological Data,
W77-03086 2A

CH2M/HILL, CORVALLIS, OREG.

Sludge - Where Will We Put It,
W77-03424 5E

CHICAGO BRIDGE AND IRON CO., PLAINFIELD, ILL. MARINE RESEARCH AND DEVELOPMENT.

High-Wave Conditions Observed Over the North Atlantic in September 1961,
W77-03090 2L

CHILE UNIV., VALPARAISO.

DEPARTAMENTO DE OCEANOLOGIA.

Phytoplankton Ecology in Valparaiso Bay: III. Phytoplankton from 1972-73, (In Spanish),
W77-03200 5C

CIVIL ENGINEERING LAB. (NAVY), PORT HUENEME, CALIF.

Ship-to-Shore Sewage Hose Handling Tests,
W77-03364 5D

COASTAL ENGINEERING RESEARCH CENTER, FORT BELVOIR, VA.

Nature and Genesis of Some Storm Washover Deposits,
W77-03293 2L

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N. H.

Delineation and Engineering Characteristics of Permafrost Beneath the Beaufort Sea,
W77-03247 2C

Dynamics of Near-Shore Ice,
W77-03268 2C

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H. NORTHERN ENGINEERING RESEARCH BRANCH.

The Classification and Geomorphic Implications of Thaw Lakes on the Arctic Coastal Plain, Alaska,
W77-03296 2C

COLORADO STATE UNIV., FORT COLLINS.

Cavitation From Surface Irregularities in High Velocity,
W77-03082 8B

COLORADO STATE UNIV., FORT COLLINS. ENGINEERING RESEARCH CENTER.

Computer Programs for Sediment Transport, Documentation and Listing,
W77-03298 2J

COLORADO UNIV., BOULDER. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.

Research Needs for the Potable Reuse of Municipal Wastewater,
W77-03356 5D

COLORADO UNIV., BOULDER. INST. OF ARCTIC AND ALPINE RESEARCH.

Study of Climatic Effects on Fast Ice Extent and its Seasonal Decay Along the Beaufort Sea Coast,
W77-03270 2C

COLUMBIA UNIV., NEW YORK. SCHOOL OF LAW.

A Closer Look at Some Issues for Genera-Oceans Policy, Marine Environment, and Fisheries,
W77-03585 6E

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF ENVIRONMENTAL MECHANICS.

On the Validity of the Theory of Flow in Saturated Swelling Materials,
W77-03280 2G

Infiltration and Water Movement in an in Situ Swelling Soil During Prolonged Ponding,
W77-03281 2G

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, TOWNSVILLE (AUSTRALIA). DIV. OF SOILS.

The Composition of Rainwater at Two Sites Near Townsville, Qld. (Australia),
W77-03279 2K

CONNECTICUT UNIV., GROTON. MARINE SCIENCES INST.

Seasonal Variation of Residual Drift in Long Island Sound,
W77-03322 2L

CONNECTICUT UNIV., STORRS. DEPT. OF CIVIL ENGINEERING.

Minimizing the Waste Discharges from Water Treatment Plants,
W77-03455 5D

CONSULTING ENGINEERS, INC., BOISE, IDAHO.

Idaho Environmental Overview,
W77-03557 6G

CORNELL UNIV., ITHACA, N.Y. DEPT. OF CIVIL ENGINEERING.

Effects of a Breakwater on Nearshore Currents Due to Breaking Waves,
W77-03297 8B

CORNELL UNIV., ITHACA, N.Y. DEPT. OF ENVIRONMENTAL ENGINEERING.

Design and Control of Nitrifying Activated Sludge Systems,
W77-03426 5D

CORPS OF ENGINEERS, CHICAGO, ILL. NORTH CENTRAL DIV.

Minimum Unit Stream Power and Fluvial Hydraulics,
W77-03080 8B

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY.

Destructive Grazing of Kelp by Sea Urchins in Eastern Canada,
W77-03199 5C

ORGANIZATIONAL INDEX

DELAWARE UNIV., NEWARK. DEPT. OF AGRICULTURAL ENGINEERING.

DELAWARE UNIV., NEWARK. DEPT. OF AGRICULTURAL ENGINEERING.

Treatment of Livestock Wastes by a Barrier Landscape Water Renovation System, W77-03116 5D

DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.

An Evaluation of Aqueous Phase Catalytic Oxidation, W77-03079 5D

DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING.

Dynamic Response of Final Settling Tanks to Residual Loading Conditions, W77-03156 5D

DEPARTMENT OF AGRICULTURE, LETHBRIDGE (ALBERTA).

The Limitation of the Ratio of Fecal Coliforms to Total Coliphage as a Water Pollution Index, W77-03472 5A

DEPARTMENT OF FORESTRY, PRETORIA (SOUTH AFRICA).

Afforestation in Low Rainfall Areas, W77-03139 4D

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, WASHINGTON, D.C. TECHNICAL COMMITTEE ON WATER QUALITY.

Water Quality in the Calumet Area. Conference on Pollution of Lower Lake Michigan, Calumet River, Grand Calumet River, Little Calumet River, and Wolf Lake, Illinois and Indiana. W77-03382 5B

DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL, DOVER, DELA. DIV. OF ENVIRONMENTAL CONTROL.

Delaware 1975 State Water Quality Inventory, W77-03378 5G

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). APPLIED HYDROLOGY DIV.

Retransmission of Hydrometric Data in Canada, W77-03111 7B

DEPARTMENT OF THE ENVIRONMENT, READING (ENGLAND). CENTRAL WATER PLANNING UNIT.

Normal-Mode Analysis of the Structure of Baseflow Recession Curves, W77-03313 2F

DEPARTMENT OF THE ENVIRONMENT, VICTORIA (BRITISH COLUMBIA). OCEAN CHEMISTRY DIV.

Distribution and Source of Tar on the Pacific Ocean, W77-03191 5B

DREXEL UNIV., PHILADELPHIA, PA. DEPT. OF ENVIRONMENTAL ENGINEERING.

Flow Equalization by Use of Aeration Tank Volume, W77-03446 5D

DU PONT DE NEMOURS (E. I.) AND CO., WILMINGTON, DEL.

One Pass Seawater Desalting RO Pilot Plant Evaluation, W77-03076 3A

EG AND G ENVIRONMENTAL CONSULTANTS, DENVER, COLO.

A Comparison of Seasonal Primary Production of Mojave Desert Shrubs During Wet and Dry Years, W77-03138 2I

EIDGENOESSISCHE FORSCHUNGSANSTALT FUER AGRIKULTURCHEMIE, BERN.

The Phosphorus Pollution of Waters Due to Agriculture, (In German), W77-03134 5B

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND). GEOLOGISCHES INSTITUT; AND EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND). GEOGRAPHISCHES INSTITUT.

Structure of the Glacier Charles Rabots Bre, Norway, W77-03311 2C

ENVIRO CONTROL, INC., ROCKVILLE, MD. ENVIRONMENTAL STUDIES GROUP.

Analytical Studies for Assessing the Impact of Sanitary Sewage Facilities of Delaware County, Ohio, W77-03353 5D

ENVIRONMENTAL CONTROL TECHNOLOGY CORP., ANN ARBOR, MICH.

Aquatic Field Survey at Iowa Army Ammunition Plant, W77-03386 5C

ENVIRONMENTAL PROTECTION AGENCY, CORVALLIS, OREG. EUTROPHICATION AND LAKE RESTORATION BRANCH.

Lake Phosphorus Loading Graphs: An Alternative, W77-03377 5C

ENVIRONMENTAL PROTECTION AGENCY, DENVER, COLO. TECHNICAL SUPPORT BRANCH.

Technical Assistance Project Greeley Wastewater Treatment Facility, Greeley, Colorado. June-July, 1972, W77-03368 5D

ENVIRONMENTAL PROTECTION AGENCY, SEATTLE, WASH.

Evaluation of Lake Milner Water Quality Model, W77-03373 5B

ENVIRONMENTAL PROTECTION AGENCY, SEATTLE, WASH. REGION X; AND ENVIRONMENTAL PROTECTION AGENCY, SEATTLE, WASH. SURVEILLANCE AND ANALYSIS DIV.

Bear River Evaluation Report, 1974 Survey, W77-03292 5B

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C.

System for Dewatering Dilute Slurries, W77-03352 5D

Paint Formulating Point Source Category Effluent Guidelines and Standards, W77-03526 5G

Virginia State Program for Control of Discharge of Pollutants to Navigable Waters; Approval, W77-03527 5G

Organic Chemicals Manufacturing Point Source Category-Effluent Limitations and Guidelines (Amendments to Regulations-Butadiene), W77-03528 5G

Proposed Toxic Pollutant Effluent Standards, W77-03529 5G

Secondary Treatment Information; Biochemical Oxygen Demand, Suspended Solids and pH, W77-03530 5G

Marine Sanitation Device Standard, W77-03531 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF PLANNING AND EVALUATION.

National Safe Drinking Water Strategy, One Step at a Time, W77-03357 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF TOXIC SUBSTANCES.

Preliminary Assessment of Suspected Carcinogens in Drinking Water: Report to Congress, W77-03360 5A

The Impact of Intensive Application of Pesticides and Fertilizers on Underground Water Recharge Areas which May Contribute to Drinking Water Problems, W77-03567 5B

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. WATER PLANNING DIV. Residual Waste Management Research and Planning Projects, September 1975, W77-03355 5B

ENVIROTECH CORP., SALT LAKE CITY, UTAH. EIMCO-BSP DIV.

Factors Affecting Powdered Carbon Treatment of a Municipal Wastewater, W77-03430 5D

ESL, INC., SUNNYVALE, CALIF.

Simulation of Pesticide Movement on Small Agricultural Watersheds, W77-03540 5B

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, CINCINNATI, OHIO. DIV. OF TECHNICAL SERVICES.

Report on Pollution in Las Vegas Wash and Las Vegas Bay, W77-03371 5C

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, EVANSVILLE, IND. OHIO RIVER BASIN PROJECT.

A Preliminary Study of the Taste and Odor Problems in Grand Lake, Ohio and the Wabash Rivers, Indiana, W77-03384 5C

FEDERAL WATER QUALITY ADMINISTRATION, KANSAS CITY, MO.

The Impact of Fargo, North Dakota's Waste Discharges on the Interstate Waters of the Red River of the North, September 1969-April 1970, W77-03361 5B

FISHERIES AND MARINE SERVICE, OTTAWA (ONTARIO). RESEARCH AND DEVELOPMENT DIRECTORATE.

Investigation of the Physical Feasibility of Mobile Fish Processing Plants, W77-03558 6B

ORGANIZATIONAL INDEX

GILLETTE CO. RESEARCH INST., ROCKVILLE, MD.

FISHERIES AND MARINE SERVICE, WINNIPEG (MANITOBA). FRESHWATER INST.

Effects of Mercury and Copper on the Olfactory Response in Rainbow Trout, *Salmo Gairdneri*,
W77-03184 5C

Effects of Chronic DDT/DDE Exposure on Anesthetic Induction and Recovery Times in Rainbow Trout (*Salmo Gairdneri*),
W77-03204 5C

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF GEOLOGY.

Beach Processes, Perrien County, Michigan,
W77-03095 2J

FLORIDA STATE UNIV., TALLHASSEE. DEPT. OF OCEANOGRAPHY.

Immediate Industrial Effects on Sediment Mercury Concentrations in a Clean Coastal Environment,
W77-03188 5B

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES.

Transferable Drug Resistance Associated with Coliforms Isolated from Hospital and Domestic Sewage,
W77-03478 5A

GARY AIRCRAFT CORP., SAN ANTONIO, TEX.

Advanced Trickling Filter for Wastewater Treatment,
W77-03365 5D

GEOLOGICAL SURVEY, ALBANY, N. Y.

WATER RESOURCES DIV.

Measured and Simulated Ground-Water Levels in the Franklin Area, Southeastern Virginia,
W77-03326 7C

Floodflow Characteristics at Proposed Bridge Site Above Sherwood Road on West Branch Delaware River, Delhi, New York,
W77-03337 4A

GEOLOGICAL SURVEY, ALBUQUERQUE, N. MEX. WATER RESOURCES DIV.

Ground-Water Levels in New Mexico, 1975,
W77-03330 7C

GEOLOGICAL SURVEY, AUSTIN, TEX.

WATER RESOURCES DIV.

Chemical and Bacteriological Quality of Water at Selected Sites in the San Antonio Area, Texas, August 1968 - January 1975,
W77-03343 5A

GEOLOGICAL SURVEY, BOSTON, MASS.

Large Sand Waves on the Atlantic Outer Continental Shelf Around Wilmington Canyon, Off Eastern United States,
W77-03332 2L

GEOLOGICAL SURVEY, CHAMPAIGN, ILL.

WATER RESOURCES DIV.

Depth and Frequency of Floods in Illinois,
W77-03346 2E

GEOLOGICAL SURVEY, DENVER, COLO.

Plan of Study of the Hydrology of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming.
W77-03338 4B

Hydrologic Studies by the U.S. Geological Survey in Oil-Shale Areas of Colorado, Utah, and Wyoming, 1976.
W77-03340 4B

GEOLOGICAL SURVEY, DORAVILLE, GA.

WATER RESOURCES DIV.

Ground-Water Quality Data for Georgia,
W77-03333 7C

GEOLOGICAL SURVEY, LAWRENCE, KANS.

WATER RESOURCES DIV.; AND

GEOLOGICAL SURVEY, LAWRENCE, KANS.

Ground-Water Resources of Greeley and Wichita Counties, Western Kansas,
W77-03347 4B

GEOLOGICAL SURVEY, MADISON, WIS.

WATER RESOURCES DIV.

Probable Maximum Flood at Lake Chippewa near Winter, Wisconsin,
W77-03349 4A

GEOLOGICAL SURVEY, MENLO PARK, CALIF.

Offshore Permafrost Studies, Beaufort Sea,
W77-03249 2L

Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions,
W77-03250 2L

Surface Current Observations - Beaufort Sea, 1972,
W77-03251 2L

Distribution and Character of Icings in Northeastern Alaska,
W77-03252 2C

A 'Herring-Bone' Pattern of Possible Taylor-Gortler-Type Flow Origin Seen in Sonographs,
W77-03253 5B

Heavy-Mineral Trends in the Beaufort Sea,
W77-03254 2L

Fault History of the Pribilof Island and Its Relevance to Bottom Stability in the St. George Basin,
W77-03256 2L

Erosion and Deposition of Shelf Sediment: Eastern Gulf of Alaska,
W77-03258 2L

Faulting and Instability of Shelf Sediments: Eastern Gulf of Alaska,
W77-03259 2L

Faulting and Instability of Shelf Sediments - Western Gulf of Alaska,
W77-03264 2L

GEOLOGICAL SURVEY, MENLO PARK, CALIF. OFFICE OF EARTHQUAKE STUDIES.

Earthquake Activity and Ground Shaking in and Along the Eastern Gulf of Alaska,
W77-03257 2L

GEOLOGICAL SURVEY, MENLO PARK, CALIF. WATER RESOURCES DIV.

Chemical Composition Data and Calculated Aquifer Temperature for Selected Wells and Springs of Honey Lake Valley, California.
W77-03342 2K

Selected Data on Water Wells, Geothermal Wells, and Oil Tests in Imperial Valley, California,
W77-03348 7C

GEOLOGICAL SURVEY, PARKVILLE, MD.

WATER RESOURCES DIV.

Hydraulic Characteristics of the Piney Point Aquifer and Overlying Confining Bed Near Dover, Delaware,
W77-03331 2F

GEOLOGICAL SURVEY, RESTON, VA.

WATER RESOURCES DIV.

Supplement to Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow,
W77-03329 2F

Hydrology and Environmental Aspects of Erie Canal (1817-99),
W77-03334 8B

Measurement of 'Turbidity' and Related Characteristics of Natural Waters,
W77-03339 7B

National Program for Managing Flood Losses: Guidelines for Preparation, Transmittal, and Distribution of Flood-Prone Area Maps and Pamphlets,
W77-03341 7C

GEOLOGICAL SURVEY, ST. PAUL, MINN.

WATER RESOURCES DIV.

Buried Aquifers in the Brocton-Belgrade and Lake Emily Areas, West-Central Minnesota--Factors Related to Developing Water for Irrigation,
W77-03335 4B

GEOLOGICAL SURVEY, TACOMA, WASH.

WATER RESOURCES DIV.

Data on Selected Lakes in Washington, Part 5,
W77-03350 7C

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.

WATER RESOURCES DIV.

High-Resolution Seismic Reflection Profiling for Mapping Shallow Aquifers in Lee County, Florida,
W77-03344 7B

GEOLOGICAL SURVEY, TRENTON, N. J.

WATER RESOURCES DIV.

Appraisal of Water Resources in the Hackensack River Basin, New Jersey,
W77-03336 2F

Summary of Geology and Ground-Water Resources of Passaic County, New Jersey,
W77-03345 4B

GEOLOGICAL SURVEY, TUCSON, ARIZ.

WATER RESOURCES DIV.

Maps Showing Ground-Water Conditions in the San Simon Area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico--1975,
W77-03327 7C

Maps Showing Ground-Water Conditions in the San Bernardino Valley Area Cochise County, Arizona--1975,
W77-03328 7C

GEORGIA UNIV., ATHENS. SCHOOL OF FOREST RESOURCES.

Multiple Use in the Southern Coastal Plains in the United States,
W77-03173 4C

GILLETTE CO. RESEARCH INST., ROCKVILLE, MD.

Ammonia Removal from Wastewater by Ligand Exchange,
W77-03367 5D

ORGANIZATIONAL INDEX

GILLETTE CO. RESEARCH INST., ROCKVILLE, MD.

GORKOVSKII MEDITSINSKII INSTITUT (USSR).

Comparative Assessment of the Effectiveness of Certain Methods Making Industrial Effluents Noncarcinogenic, (In Russian), W77-03488 5D

GOVERNMENT FOREST EXPERIMENT STATION, TOKYO (JAPAN).

Changes in the Transpiration Rate and Leaf Water Content in Several Varieties of Cryptomeria Japonica Subjected to Water Stress, (In Japanese), W77-03155 2D

GREELEY AND HANSEN, PHILADELPHIA, PA.

Automation: A Short History, But a Long Future, W77-03469 5D

GRUMMAN ECOSYSTEMS CORP.,

BETHPAGE, N. Y.; AND LAWLER, MATUSKY AND SKELLY ENGINEERS, TAPPAN, N. Y. Winter Conditions in the New York Bight, 1973-1974, W77-03380 5C

GUELPH UNIV. (ONTARIO). DEPT. OF ZOOLOGY.

Effects of Crude Oil on American Lobster (Homarus Americanus) Larvae in the Laboratory, W77-03197 5C

Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (Salmo gairdneri), W77-03203 5C

HADASSAH MEDICAL SCHOOL, JERUSALEM (ISRAEL). ENVIRONMENTAL HEALTH LAB.

Risk of Communicable Disease Infection Associated with Waste Water Irrigation in Agricultural Settlements, W77-03485 5C

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.

Annual Report, 1975-1976, (Hawaii Water Resources Research Center), W77-03165 9D

HAWAIIAN SUGAR PLANTER' ASSOCIATION EXPERIMENT STATION, HONOLULU.

Calibration of Neutron Probe in Some Selected Hawaiian Soils, W77-03321 2G

HEBREW UNIV., JERUSALEM (ISRAEL).

HUMAN ENVIRONMENTAL SCIENCES LAB. Toxicity of Ammonia to Algae in Sewage Oxidation Ponds, W77-03413 5D

HOLZMACHER, MCLENDON AND MURRELL, MELVILLE, N. Y.

Infiltration/Inflow Improvements in the Oyster Bay Sewer District, W77-03401 5D

HUNT (RODNEY) AND CO., ORANGE, MASS.

Denver's Headworks Reflects Complexity of System, W77-03412 5D

HYDROLOGIC ENGINEERING CENTER, DAVIS, CALIF.

Hydrologic Engineering Methods for Water Resources Development, Volume 5, Hypothetical Floods, W77-03104 8B

Hydrologic Engineering Methods for Water Resources Development, Volume 6, Water Surface Profiles, W77-03105 8B

IDAHO UNIV., MOSCOW.

Oxygen Transfer in a 23-Meter Bubble Column, W77-03579 5D

An Economic Evaluation of Deep Tank Aeration for Wastewater Treatment, W77-03580 5D

IDAHO UNIV., MOSCOW. DEPT. OF ZOOLOGY.

Heavy Metals in Lakes of the Coeur d'Alene River Valley, Idaho, W77-03207 5B

IDAHO UNIV., MOSCOW. WATER RESOURCES RESEARCH INST.

Publications List of the Idaho Water Resources Research Institute, W77-03154 10C

An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report. W77-03157 6B

IDAHO WATER RESOURCE BOARD, BOISE.

The Objectives, Part I of the State Water Plan, (Idaho Water Resources Board). W77-03544 6B

ILLINOIS NATURAL HISTORY SURVEY, HAVANA. RIVER RESEARCH LAB.

Environmental Inventory and Assessment of Navigation Pools 24, 25, and 26, Upper Mississippi and Lower Illinois Rivers; An Electrofishing Survey of the Illinois River, W77-03302 8I

ILLINOIS NATURAL HISTORY SURVEY, URBANA.

Effects of Potassium on Adult Asiatic Clams, Corbicula Manilensis, W77-03119 5C

ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.

The Illinois Coastal Zone Management Program: First Year Work Product. Volume II. Coastal Geological Studies. W77-03103 2H

ILLINOIS STATE WATER SURVEY, URBANA.

Relation Between Atmospheric Pollution, Precipitation, and Streamwater Quality Near A Large Urban-Industrial Complex, W77-03097 5B

A Review of Hail-Measuring Instruments, W77-03101 2B

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRICULTURAL ECONOMICS.

Local Water Systems are Frequently Neglected, W77-03121 6B

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.

Application of a Model for Layout and Design of Sewer Systems, W77-03133 5B

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). DEPT. OF PUBLIC HEALTH ENGINEERING.

Effect of Water Chlorination Upon Levels of Some Polynuclear Aromatic Hydrocarbons in Water, W77-03459 5F

INSTITUT EKSPERIMENTALNOI

KLINICHESKOI ONKOLOGII, MOSCOW (USSR).

Permissible Level of Benzo(A)Plyrene in Water Bodies, (In Russian), W77-03117 5B

INSTITUTE FOR LAND AND WATER

MANAGEMENT RESEARCH, WAGENINGEN (NETHERLANDS).

Simulation of Field Water Uptake by Plants Using a Soil Water Dependent Root Extraction Function, W77-03315 2G

INSTITUTE OF MARINE RESEARCH, BERGEN (NORWAY).

Pelagic Tar in the Norwegian Coastal Current, W77-03190 5B

INTERNATIONAL JOINT COMMISSION-UNITED STATES AND CANADA. GREAT LAKES WATER QUALITY BOARD.

Great Lakes Water Quality; Fourth Annual Report to the International Joint Commission. W77-03383 5G

IOWA NATURAL RESOURCES COUNCIL, DES MOINES.

Iowa's Water Resources Program Progress and Needs. W77-03547 6B

IOWA NATURAL RESOURCES COUNCIL, DES MOINES. TECHNICAL COORDINATING COMMITTEE.

Iowa Water Resources Framework Study Plan of Study. W77-03561 6B

IOWA STATE UNIV., AMES. DEPT. OF CIVIL ENGINEERING.

The Electrolytic Respirometer - I. Factors Affecting Oxygen Uptake Measurements, W77-03457 5A

Effect of Variable Loading on Oxygen Uptake, W77-03473 5D

IOWA UNIV., IOWA CITY. INST. OF ECONOMIC RESEARCH.

Projections of Population, Employment, Income and Water Use for Iowa River Basins, 1975-2020, W77-03542 6D

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF EARTH AND PLANETARY SCIENCES.

A Model for the Control of Dissolved Manganese in the Interstitial Waters of Chesapeake Bay, W77-03556 5B

KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.

Biological and Chemical Evaluation of the Aquatic Environment of Selected Undeveloped Kentucky Lake Embayments, W77-03209 5C

KRISTINEBERGS ZOOLOGISKA STATION (SWEDEN).

Effects on Fertilization and Development of the Common Mussel, Mytilus Edulis After Long-Term Exposure to a Nonionic Surfactant, W77-03198 5C

ORGANIZATIONAL INDEX

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.

KYOTO UNIV. (JAPAN). FACULTY OF ENGINEERING; AND KYOTO UNIV. (JAPAN). DEPT. OF SANITARY ENGINEERING.

Combined Process of Pyrolysis and Combustion for Sludge Disposal, W77-03415 5D

LAKE HERMAN DEVELOPMENT ASSOCIATION, INC., MADISON, S. DAK.

Silt Removal from a Lake Bottom, W77-03392 5C

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N. Y.

A Seismotectonic Study of Seismic and Volcanic Hazards in the Pribilof Islands - Eastern Aleutian Islands Region of the Bering Sea, W77-03243 2L

LANCASTER UNIV., BAILRIGG (ENGLAND). LANCASHIRE AND WESTERN SEA FISHERIES JOINT COMMITTEE.

Surf-Zone Water Quality in Liverpool Bay, W77-03092 5B

LOUISIANA STATE UNIV., BATON ROUGE. COASTAL STUDIES INST.

Breakup Flooding and Nutrient Source of Colville River Delta During 1973, W77-03388 5B

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF RURAL SOCIOLOGY RESEARCH.

Environmental Concern as a Factor in Coastal Zone Development: A Study of Louisiana Citizens, W77-03590 6G

LOUISVILLE UNIV., KY. DEPT. OF BIOLOGY.

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Beaufort Sea, W77-03217 5C

Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska, W77-03218 5C

LOUISVILLE UNIV., KY. DEPT. OF ENVIRONMENTAL ENGINEERING.

The Kinetics of Adsorption of Phenols by Granular Activated Carbon, W77-03149 5D

M AND B ASSOCIATES, SAN RAMON, CALIF.

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Executive Summary, W77-03212 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume I - Meteorology and Hydrology of the Northern Sierra Nevada, Final Report, W77-03213 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume II - Physical and Statistical Design, Final Report, W77-03214 3B

Weather Modification Design Study for Streamflow Augmentation in the Northern Sierra Nevada, Volume III - Operational Design, Final Report, W77-03215 3B

MAINE UNIV., ORONO. DEPT. OF ZOOLOGY.

Effect of Zinc-Coated Culverts on Vertebrate and Invertebrate Fauna in Selected Maine Streams, W77-03170 5C

MANDER, RAIKES AND MARSHALL, BRISTOL (ENGLAND).

Tertiary Treatment of Sewage Effluents, W77-03453 5D

MARQUETTE UNIV., MILWAUKEE, WIS. DEPT. OF CIVIL ENGINEERING.

Effluent Variability Estimation for Complete-Mix Activated Sludge Treatment Systems, W77-03434 5D

MARYLAND UNIV., COLLEGE PARK. DEPT. OF CIVIL ENGINEERING.

Behavior of Ground Water Subject to Irrigation of Effluent - A Case Study, W77-03158 5D

MARYLAND UNIV., SOLOMONS, MD. CHESAPEAKE BIOLOGICAL LAB.

Seasonal Interactions Among Estuarine Primary Producers and Herbivores, W77-03387 2L

MARYLAND UNIV., SOLOMONS. NATURAL RESOURCES INST.

Assateague Ecological Studies, W77-03381 5C

MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION, AMHERST.

Measurement of Nonexchanging Pores During Miscible Displacement in Soils, W77-03320 2G

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING; AND MASSACHUSETTS INST. OF TECH., CAMBRIDGE. CONSTRUCTED FACILITIES DIV.

Undrained Behavior of Embankments on New Liskeard Varved Clay, W77-03108 8D

MASSEY UNIV., PALMERSTON NORTH (NEW ZEALAND). DEPT. OF GEOGRAPHY.

The Unit Hydrograph: A Satisfactory Model of Watershed Response, W77-03126 4D

Seasonal Demarcation in Pennsylvania for Hydrological Use, W77-03127 2B

MCGILL UNIV., MONTREAL (QUEBEC). MARINE SCIENCES CENTRE.

Time-Depth Variations in Tidal Flux of Suspended Matter in the Saint Lawrence Estuary, W77-03091 2L

MELBOURNE UNIV., PARKVILLE (AUSTRALIA). DEPT. OF AGRICULTURAL CHEMISTRY.

Reactions of Heavy Metals With Soils With Special Regard to Their Application in Sewage Wastes, W77-03359 5B

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF BOTANY.

Investigations on the Role of Dissolved Organic Matter in Determining Ecosystem Structure and Function: The Plankton and Photoheterotrophy, W77-03389 5C

MICHIGAN UNIV., ANN ARBOR.

The Effects of Sewage Effluent on Wetland Ecosystems, W77-03354 5C

MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.

Phytoplankton Response to Phosphorus and Silica Enrichments in Lake Michigan, W77-03537 5C

MINNESOTA UNIV., MINNEAPOLIS. LIMNOLOGICAL RESEARCH CENTER.

The Impact of a Forest Fire on a Wilderness Lake in Northeastern Minnesota, W77-03375 5B

MISSOURI UNIV., COLUMBIA. DEPT. OF CIVIL ENGINEERING.

Characterization and Dewaterability of Water Treatment Plant Residues, W77-03130 5D

Liming Farmland with Calcium Sludge, W77-03163 5D

MISSOURI UNIV., COLUMBIA. DEPT. OF GEOLOGY.

Hydrogeology of the Missouri River Flood Plain near Glasgow, Missouri, W77-03164 2F

MISSOURI UNIV., ROLLA. DEPT. OF CIVIL ENGINEERING.

A Study on the Application of Biogrowth Sheets to Improve Lagoon Effluent Quality, W77-03162 5D

MONTGOMERY COUNTY SEWER AUTHORITY, OAKS, PA.

An Operator's Approach to Aerobic Digester Supernatant Disposal Problems, W77-03449 5D

MOSKOVSKII GOSUDARSTVENNYI MEDITSINSKII INSTITUT (I) (USSR).

Hygienic Substantiation of the Maximum Permissible Concentration of Tin Tributylmethacrylate in Water Bodies, (In Russian), W77-03107 5A

MOSKOVSKII LESOTEKHNICHESKII INSTITUT (USSR).

The Regulation of Transpiration Expenditure of Moisture by Plants with the Aid of Antitranspirants, (In Russian), W77-03475 3B

MUSEUM NATIONAL D' HISTOIRE NATURELLE, PARIS (FRANCE).

LABORATOIRE DE PHYSIOLOGIE GENERALE ET COMPAREE. Influence of Illumination on Phytotoxicity of Crude Oil, W77-03193 5C

NAGASAKI UNIV. (JAPAN). FACULTY OF PHARMACEUTICAL SCIENCE.

Cultivation and Breeding of Oenothera-Plant: IV. Effect of Soil Moisture on Growth and Components in Seed of O. Biennis, (In Japanese), W77-03148 2I

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.

Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements, W77-03220 5A

ORGANIZATIONAL INDEX

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C. TRACE ORGANIC ANALYSIS GROUP.

Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for: (A) Trace Hydrocarbon Analysis in Sea Ice and at the Sea Ice-Water Interface, (B) Analysis of Individual High Molecular Weight Aromatic Hydrocarbons, W77-03219 5A

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. SOLID AND HAZARDOUS WASTE RESEARCH LAB.

Degradation Mechanisms: Controlling the Bioaccumulation of Hazardous Materials, W77-03391 5B

NATIONAL ENVIRONMENTAL RESEARCH CENTER, COLLEGE, ALASKA. ARCTIC ENVIRONMENTAL RESEARCH LAB.

Chlorine Disinfection of Treated Wastewater in a Baffled Contact Chamber at Less Than 1 C, W77-03363 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CORVALLIS, OREG.

Transport of Pollutants in the Vicinity of Prudhoe Bay, Alaska, W77-03238 5B

NATIONAL GEOPHYSICAL AND SOLAR-TERRESTRIAL DATA CENTER, BOULDER, COLO.

A Historical Summary of Earthquake Epicenters in and Near Alaska, W77-03265 7C

NATIONAL INST. FOR WATER RESEARCH, PRETORIA, SOUTH AFRICA.

Behaviour in Conventional Sewage Purification Processes of Coliform Bacteria with Transferable or Non-Transferable Drug-Resistance, W77-03435 5D

NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH. NORTHWEST FISHERIES CENTER.

Physical Oceanography of the Gulf of Alaska, W77-03241 5B

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO. WAVE PROPAGATION LAB.

Development and Operation of HF Current-Mapping Radar Units-Physical Oceanography, W77-03227 5B

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, MIAMI, FLA. ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABS.

Outer Continental Shelf Energy Program, W77-03234 5B

Assessment of Offshore Dumping in the New York Bight, Technical Background: Physical Oceanography, Geological Oceanography, and Chemical Oceanography, W77-03358 5B

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SEATTLE, WASH. PACIFIC MARINE ENVIRONMENTAL LAB.

Distribution of Light Hydrocarbons, C1-C14, in the Northeast Gulf of Alaska and the Southeastern Bering Shelf, W77-03221 5B

Gulf of Alaska Study of Mesoscale Oceanographic Processes (Gas-Mop), W77-03230 6G

Numerical Studies of Alaskan Region, W77-03231 5B

Bristol Bay Oceanographic Processes (B-BOP), W77-03232 5B

Near-Shore Atmospheric Modification, W77-03242 5B

Distribution, Composition and Transport of Suspended Particulate Matter in the Gulf of Alaska and Southeastern Bering Shelf, W77-03248 2L

NATIONAL WEATHER SERVICE, KANSAS CITY, MO. CENTRAL REGION.

Guidelines for Flash Flood and Small Tributary Flood Prediction, W77-03114 4A

NATIONAL WEATHER SERVICE, SILVER SPRING, MD. OFFICE OF HYDROLOGY.

Joint Probability Method of Tide Frequency Analysis Applied to Apalachicola Bay and St. George Sound, Florida, W77-03304 2L

NAUCHNO-ISSEDOVATELSKII INSTITUT EPIDEMIOLOGII I MIKROBIOLOGII, LVOV (USSR).

Experimental Substantiation of the Maximal Permissible Concentrations of Triethanolamine, Ammonium and Calcium Salts of Alkylbenzenesulfates in Water Bodies, (In Russian), W77-03586 5B

NAVAL ENVIRONMENTAL PREDICTION RESEARCH FACILITY, MONTEREY, CALIF.

Preparation of Hydrodynamical-Numerical and 3-Parameter Small-Mesh Atmospheric Models for Coastal Waters in the Gulf of Alaska, W77-03235 5B

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF. RESEARCH DEPT.

Electrostatic Induction Parameters to Attain Maximum Spray Charge to Clear Fog, W77-03299 3B

NEVADA DIV. OF WATER RESOURCES, CARSON CITY. OFFICE OF STATE ENGINEER..

Water for Nevada. Water Planning Report, W77-03545 6B

NEVADA UNIV., RENO. CENTER FOR WATER RESOURCES RESEARCH.

Water Quality Simulation of Tahoe-Truckee System, Nevada-California - Volume II - Appendices, W77-03351 5A

NEW JERSEY INST. OF TECH., TRENTON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.

Sludge Dewatering Pilot Plant Design, Part I, W77-03416 5D

NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING.

The Rotating Biological Filter, W77-03282 5D

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY; AND VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.

A Butane Freezing Process for Dewatering Sludge, W77-03153 5D

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY. ENVIRONMENTAL QUALITY RESEARCH AND DEVELOPMENT UNIT.

Grant Aid for Plant Operations: An Evaluation, W77-03483 5G

NORSK INSTITUTT FOR VANNFORSKNING, BLINDERN.

Water Quality, Plankton and Eutrophication of Bergsvatnet, Eikeren and Fiskumvatnet, S. Norway, (In Norwegian), W77-03595 5C

NORTH CAROLINA DIV. OF MARINE FISHERIES, RALEIGH.

Rehabilitation of Pamlico Sound Oyster Producing Grounds Damaged or Destroyed by Hurricane Ginger, W77-03562 6B

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF GEOSCIENCES.

Flow Dynamics of the Neuse River Estuary, W77-03300 2L

NORTH CAROLINA UNIV. AT CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.

Field Monitoring Techniques and Data Analysis, W77-03150 5A

NORTH CAROLINA UNIV. AT GREENSBORO. DEPT. OF BIOLOGY.

Cyanophage Analysis as a Biological Pollution Indicator-Bacterial and Viral, W77-03460 5A

OAK RIDGE NATIONAL LAB. TENN.

OPTRM - A Hydrologic Transport Model With Parameter Optimization, W77-03115 5B

Fermentation of Waste Materials to Produce Industrial Intermediates, W77-03563 5D

OAK RIDGE NATIONAL LAB., TENN. ENVIRONMENTAL SCIENCES DIV.

Effect of Temperature and Salinity on Extension of Siphons by Mercenaria Mercenaria, W77-03205 5C

Photolysis of 5-Chlorouracil in Natural Waters, W77-03477 5B

OFFICE OF WATER RESEARCH AND TECHNOLOGY, WASHINGTON, D. C.

Report on Tenth Annual Water Resources Research Conference, Sponsored by Office of Water Research and Technology, April 9-10, 1975, W77-03206 9D

OHIO STATE UNIV., COLUMBUS. DEPT. OF AGRONOMY.

Soil Potassium Relationships as Indicated by Solution Equilibria and Plant Uptake, W77-03395 2G

OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS. INST. OF POLAR STUDIES AND OHIO STATE UNIV., COLUMBUS. DEPT. OF GEOLOGY AND MINERALOGY.

Radio-Echo Layers and the Recent Stability of the West Antarctic Ice Sheet, W77-03100 2C

ORGANIZATIONAL INDEX

TASMANIA UNIV., HOBART (AUSTRALIA). DEPT. OF BOTANY.

OIL POLLUTION SOUTH EAST KENT, DOVER (ENGLAND).

Olympic Alliance Oil Spillage, W77-03195 5C

OKLAHOMA STATE UNIV., STILLWATER.

DEPT. OF AGRICULTURE ENGINEERING. Physiochemical and Biological Conditions in Two Oklahoma Reservoirs Undergoing Artificial Destratification, W77-03208 2H

OKLAHOMA STATE UNIV., STILLWATER.

DEPT. OF AGRONOMY. Evapotranspiration Reduction by Field Geometry Effects, W77-03169 2D

ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO.

Coastal Region Residence Time Estimates from Concentration Gradients, W77-03093 5C

ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. POLLUTION CONTROL BRANCH.

Monitoring of Community Water Supplies, W77-03463 5A

OREGON STATE UNIV., CORVALLIS. DEPT. OF CIVIL ENGINEERING.

Hydrodynamic Forces on Multiple Circular Cylinders, W77-03081 8B

OREGON STATE UNIV., CORVALLIS. DEPT. OF MICROBIOLOGY.

Baseline Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Crude Oil Degradation by Psychrophilic Bacteria, W77-03223 5C

OREGON STATE UNIV., CORVALLIS. SEA GRANT COLL. PROGRAM; AND OREGON STATE UNIV., OCEAN RESOURCES LAW PROGRAM.

Northwest Mariculture Laws, W77-03598 6E

PARIS UNIV., THONON-LES-BAINS (FRANCE).

CENTER FOR GEODYNAMIC RESEARCH. Biogeochemical Development of the Lake of Geneva (Switzerland) from 1957 to 1973: Part III, (In French), W77-03144 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. INST. FOR RESEARCH ON LAND AND WATER RESOURCES.

Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method, W77-03147 5D

PITTSBURGH UNIV., PA.

Studies on a Mechanism for Salt Rejection in Reverse Osmosis Membranes as a Guide to Improved Materials for Desalination of Sea Water, W77-03290 3A

Experimental Ecology of Selected Vertebrate Species, W77-03564 6G

PORTLAND STATE UNIV., OREG. URBAN STUDIES CENTER.

A Review of Clustering Techniques with Emphasis on Benthic Ecology, W77-03372 5A

PUBLIC HEALTH SERVICE, DENVER, COLO. DIV. OF WATER SUPPLY AND POLLUTION CONTROL.

State and County Area Tabulations for the Colorado River Basin, W77-03110 7C

PUBLIC HEALTH SERVICE, PORTLAND, OREG. DIV. OF WATER SUPPLY AND POLLUTION CONTROL.

Pollution of Interstate Waters of the Lower Columbia River Bonneville Dam to Cathlamet, Washington, W77-03385 5B

PUBLIC HEALTH SERVICE, WASHINGTON, D. C. WATER QUALITY SECTION.

Water Pollution Surveillance in the United States. Report Number 1, Missouri River Main Stem, 1958-1962, W77-03379 5A

Variations of Coliform Bacteria and Other Pollution Indices in Surface Waters, W77-03539 5B

PURDUE UNIV., LAFAYETTE, IND. WATER RESOURCES RESEARCH CENTER.

Practical Alternatives to 2,4,5-T for Chemical Control of Brush Along Drainage Ditches and General Watershed Use, W77-03168 5G

QUEENSLAND DEPT. OF PRIMARY INDUSTRIES, EMERALD (AUSTRALIA).

Time of Planting Effects on Development, Yield, and Oil Quality of Irrigated Sunflower, W77-03135 3F

QUEENSLAND DEPT. OF PRIMARY INDUSTRIES, WARWICK (AUSTRALIA).

Effect of Water Stress on the Phasic Development of Annual Medicago Species, W77-03136 2I

READING UNIV. (ENGLAND). DEPT. OF GEOLOGY; AND READING UNIV. (ENGLAND). SEDIMENTOLOGY RESEARCH LAB.

A Cine-Camera Technique for Process Measurement on a Ridge and Runnel Beach, W77-03325 2L

RENSSELAER POLYTECHNIC INST., TROY, N. Y. DEPT. OF CHEMICAL ENGINEERING AND RENSSELAER POLYTECHNIC INST., TROY, N. Y. DEPT. OF ENVIRONMENTAL ENGINEERING.

Precipitation Chemistry Studies at Lake George: Acid Rains, W77-03098 5A

RHODE ISLAND UNIV., KINGSTON, DEPT. OF GEOLOGY.

Coastal Morphology and Sedimentation, Gulf Coast of Alaska (Glacial Sedimentation), W77-03244 5B

RICE UNIV., HOUSTON, TEX. DEPT. OF ENVIRONMENTAL SCIENCE AND ENGINEERING.

The Influence of Carbon-Nitrogen Ratio on the Chlorination of Microbial Aggregates, W77-03414 5D

RICHARDSON (EDWARD H.) ASSOCIATES, INC., NEWARK, DEL.

Innovations in Sewer Design and Construction, W77-03399 8G

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J.

Temporal Variations in Tributary Phosphorus Loads, W77-03123 5B

SALA MAGNETICS, INC., CAMBRIDGE, MASS.

High Gradient Magnetic Filtration, W77-03418 5D

SANDIA LABS., ALBUQUERQUE, N. MEX.

Heat Inactivation of Poliovirus in Waste Water Sludge, W77-03448 5C

SANITARNIO-GIGIENICHESKII MEDITSINSKII INSTITUT, LENINGRAD (USSR).

Hygienic Standardization of the Content in Water of Monoisobutylamine and Diisobutylamine During their Combined Action, (In Russian), W77-03481 5B

SAVE LAKE SUPERIOR ASSOCIATION, DULUTH, MINN.

The People's Lake, W77-03594 5G

SHELL OIL CO., HOUSTON, TEX. (ASSIGNEE).

Fluidized Waste Incinerator and Method, W77-03489 5D

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF GEOLOGY.

Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska, W77-03245 2L

SOUTH DAKOTA STATE UNIV., BROOKINGS. DEPT. OF CIVIL ENGINEERING.

Suitability of Lagoon Effluents for Irrigation in South Dakota, W77-03152 5D

SOUTHERN ILLINOIS UNIV., CARBONDALE.

Determination of Maximum Permissible Levels of Selected Chemicals that Exert Toxic Effects on Plants of Economic Importance in Illinois, W77-03565 5A

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.

Strength of Ice Under Multiaxial Loading, W77-03301 2C

STATE UNIV. OF NEW YORK COLL. AT BUFFALO. GREAT LAKES LAB.

Impacts of the Deposition of Dredged Spoils on Lake Erie Sediment Quality and Associated Biota, W77-03094 5C

STEARNS AND WHELER, CAZENOVIA, N.Y.

Concentric Waste-Treatment Plant Saves Land, Cuts Cost, W77-03427 5D

TASMANIA UNIV., HOBART (AUSTRALIA). DEPT. OF BOTANY.

Aspects of the Chemical Variability of some Tasmanian Inland Waters (Australia), W77-03283 2K

Chemistry of Salt Lakes and Other Waters in the Sub-Humid Regions of Tasmania (Australia), W77-03284 2H

TECHNICAL UNIV. OF ISTANBUL (TURKEY). DEPT. OF HYDRAULIC AND WATER POWER;

ORGANIZATIONAL INDEX

TASMANIA UNIV., HOBART (AUSTRALIA). DEPT. OF BOTANY.

AND TECHNICAL UNIV. OF ISTANBUL
(TURKEY). DEPT. OF CIVIL ENGINEERING.
Wet and Dry Periods of Annual Flow Series,
W77-03319 2E

TECHNISCHE HOGESCHOOL TWENTE,
ENSCHDE (NETHERLANDS). DEPT. OF
CHEMISTRY.

Activated Carbon From Activated Sludge,
W77-03425 5D

TENNESSEE UNIV., KNOXVILLE.

AGRICULTURAL EXPERIMENT STATION.
Determining the Most Profitable Nitrogen Fer-
tilization for Corn Production,
W77-03172 3F

TEXAS A AND M UNIV., COLLEGE STATION,
DEPT. OF OCEANOGRAPHY.

Salinity Induced Horizontal Estuarine Circula-
tion,
W77-03312 2L

TEXAS A AND M UNIV., COLLEGE STATION.
DEPT. OF SOIL AND CROP SCIENCES.

Water Stress Induced Alterations of the Stom-
atal Response to Decreases in Leaf Water
Potential,
W77-03140 2I

TEXAS UNIV. HEALTH SCIENCE CENTER AT
SAN ANTONIO. DEPT. OF PATHOLOGY.

Rapid Detection of Bacterial Endotoxins in
Drinking Water and Renovated Waste Water,
W77-03474 5A

TOKYO INST. OF TECH. (JAPAN). DEPT. OF
CIVIL ENGINEERING.

Flow and Bed Topography in Curved Open
Channels,
W77-03084 8B

TOLEDO UNIV., OHIO. DEPT. OF CHEMICAL
ENGINEERING.

Investigation of Oxygen Transfer to Slime as a
Surface Reaction,
W77-03476 5B

TRENT POLYTECHNIC, NOTTINGHAM
(ENGLAND). DEPT. OF LIFE SCIENCES.

The Application of the Foam Fractionation
Process to the Removal of Viruses. Part I. The
Production of a Mathematical Model to Predict
the Efficiency of Virus Removal,
W77-03433 5D

UNIVERSIDAD NACIONAL AUTONOMA DE
MEXICO, MEXICO CITY. INSTITUTO DE
BIOLOGIA.

Plankton of Coastal Lagoons: XI. Transport in
Three Estuaries of the Northwest of Mexico
(November, 1973) (In Spanish),
W77-03145 2L

UNIVERSIDADE FEDERAL DO RIO GRANDE
DO SUL, PORTO ALEGRE (BRAZIL).

Quadratic Finite Elements in Shallow Water
Problems,
W77-03083 8B

UNIVERSITY COLL., CORK (IRELAND).
DEPT. OF BOTANY

Effects of Oil on Beaches in West Cork, Ire-
land,
W77-03192 5C

The Effect of Oil Pollution in Bantry Bay,
W77-03194 5C

UNIVERSITY COLL., LONDON (ENGLAND).
DEPT. OF GEOGRAPHY.

The Response of Natural Channels to Ur-
banization: Two Case Studies from Southeast
England,
W77-03314 4C

UNIVERSITY OF MANCHESTER INST. OF
SCIENCE AND TECHNOLOGY (ENGLAND).

Experiments on Wastewater Sedimentation,
W77-03574 5D

UNIVERSITY OF SOUTH FLORIDA, ST.

PETERSBURG. DEPT. OF MARINE SCIENCE.
Calibration of a Thermal Enrichment Model for
Shallow, Barricaded Estuaries,
W77-03171 5B

UNIVERSITY OF SOUTHERN CALIFORNIA,
LOS ANGELES. DEPT. OF GEOLOGICAL
SCIENCES.

Relationships Between Sand Input from Rivers
and the Composition of Sands from the
Beaches of Southern California,
W77-03324 2L

UPSALA KOMMUN NATURVARDVERKETS
RR-UNDERSOKNING (SWEDEN). ALGESTLAB.
FYSIOL. BOT.

Nature Preservation Activity RR Investigation:
Part 6. A Modified Method of Measuring the
Chemical Oxygen Demand Gives a High
Analytical Capacity, (In Swedish),
W77-03589 5A

UTAH DIV. OF WATER RESOURCES, SALT
LAKE CITY.

Hydrologic Inventory of the San Rafael Study
Unit,
W77-03552 4A

The State of Utah Water - 1975,
W77-03559 6B

The State of Utah Water.
W77-03560 6D

UTAH STATE UNIV., LOGAN. COLL. OF
ENGINEERING.

User Oriented Systems Analysis for Regional
Municipal Water Supply Planning,
W77-03159 6A

Reproduction by Adfluvial Salmonids in Spawn
Creek, Cache County, Utah,
W77-03160 2I

UTAH WATER RESEARCH LAB., LOGAN.

Low Flow Modeling in Small Steep
Watersheds,
W77-03316 4D

VANDERBILT UNIV., NASHVILLE, TENN.

Aeration and Oxygen Transfer in Biological
Reactors,
W77-03575 5D

VILLANOVA UNIV., PA. INST. OF WORLD
ORDER RESEARCH.

Coming Showdown: Ocean Nationalism and
the Senate 200-Mile Shelf Bill,
W77-03591 6E

VIRGINIA POLYTECHNIC INST. AND STATE
UNIV., BLACKSBURG. DEPT. OF CIVIL
ENGINEERING.

Elemental Distribution Diagrams for Biological
Wastewater Treatment,
W77-03429 5D

VIRGINIA UNIV., CHARLOTTESVILLE, VA.

Methods of Dissolved Oxygen Budget Analysis
for Assessing Effects of Dredged Material
Disposal on Biological Community Metabolism,
W77-03393 5C

VOROSHILOVGRADSKII MEDITSINSKII
INSTITUT (USSR).

Sanitary-Bacteriological Study of the Effective-
ness of Decontaminating the Sewage of
Voroshilovgrad on Sewage Farms, (In Rus-
sian),
W77-03128 5D

WASHINGTON STATE UNIV., PULLMAN.

DEPT. OF AGRICULTURAL ECONOMICS.
A Computer Program for Estimating Costs of
Owning and Operating an Irrigation Well Under
Conditions of Declining Water Levels,
W77-03211 6C

WASHINGTON UNIV., SEATTLE. DEPT. OF
ATMOSPHERIC SCIENCES.

Dynamics of Near-Shore Ice (Data Buoys),
W77-03269 2C

WASHINGTON UNIV., SEATTLE. DEPT. OF
OCEANOGRAPHY.

Current Measurements in the Beaufort Sea,
W77-03228 2L

STD Mappings of the Beaufort Sea Shelf,
W77-03233 2L

The Interaction of Oil with Sea Ice in the Arc-
tic Ocean,
W77-03267 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF
ZOOLOGY.

Response of Daphnia Population Size and Age
Structure to Predation,
W77-03390 2H

WASHINGTON UNIV., SEATTLE. INST. FOR
ENVIRONMENTAL STUDIES.

Electric Power Development in the Pacific
Northwest Region: Institutional Commitments
and Alternatives, Phase I,
W77-03288 6E

WATERLOO UNIV. (ONTARIO). DEPT. OF
CHEMISTRY.

Model Studies in Aqueous Chlorination: The
Chlorination of Phenols in Dilute Aqueous
Solutions,
W77-03458 5A

WATERS (EDWARD) AND SONS,
MELBOURNE (AUSTRALIA). (ASSIGNEE).

Sewerage Treatment Apparatus,
W77-03406 5D

WESLEYAN UNIV., MIDDLETOWN, CONN.
DEPT. OF EARTH AND ENVIRONMENTAL
SCIENCES.

Yukon Delta Coastal Processes Study,
W77-03255 2L

WEST VIRGINIA UNIV., MORGANTOWN.

ENGINEERING EXPERIMENT STATION.
Scour Around Bridge Piers,
W77-03294 8B

WEST WALES NATURALIST TRUST,
HAVERFORDWEST (ENGLAND).

Effects of Oil Pollution on Breeding Grey
Seals,
W77-03187 5C

ORGANIZATIONAL INDEX

YALE UNIV., NEW HAVEN, CONN. DEPT. OF GEOLOGY AND GEOPHYSICS.

WESTERN WASHINGTON RESEARCH AND EXTENSION CENTER, PUYALLUP.

Effect of Added Salts on Nitrogen Released
and Nitrate Levels in Forest Soils of the
Washington Coastal Area,
W77-03396 2G

WISCONSIN UNIV. -MADISON.

Prediction of Water Transmission in Condi-
tioned Soils,
W77-03451 2G

Water Rights,
W77-03599 6E

WISCONSIN UNIV., MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.

Two Dimensional Bottom Withdrawal from a
Density-Stratified Reservoir,
W77-03129 4A

A Perturbation Approach to Two-Dimensional
Bottom Withdrawal from a Density-Stratified
Reservoir,
W77-03151 4A

WISCONSIN UNIV., MADISON. LAB., OF LIMNOLOGY.

Distribution of Pelagic Zooplankton within a
Thermal Gradient in Lake Columbia, a Cooling
Lake near Portage, Wisconsin,
W77-03077 5C

Distribution and Feeding of Pumpkinseed
(Lepomis gibbosus) and Black Crappie
(Pomoxis nigromaculatus) in a power plant
cooling lake,
W77-03078 5C

WISCONSIN UNIV., MADISON. WATER CHEMISTRY LAB.

Organic Phosphorus in Lakes,
W77-03210 5C

WISCONSIN UNIV. -MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.

Intermittent Sand Filtration of Household
Wastewater,
W77-03452 5D

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.

Current Structure and Mixing in the
Shelf/Slope Water Front South of New En-
gland,
W77-03087 2L

Eddy Kinetic Energy in the Deep Western
North Atlantic,
W77-03088 2L

The Bottom Boundary Layer of the Deep
Ocean,
W77-03089 2L

WYOMING UNIV., LARAMIE. DEPT. OF GEOLOGY; AND WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.

Permeability and Ground Water Circulation in
the Madison Aquifer Along the Eastern Flank
of the Bighorn Mountains of Wyoming,
W77-03122 2F

YALE UNIV., NEW HAVEN, CONN. DEPT. OF GEOLOGY AND GEOPHYSICS.

Sediment Mass Balance of a Large Estuary,
Long Island Sound,
W77-03323 2L

THE HISTORY OF THE UNITED STATES OF AMERICA FROM 1789 TO 1876

CHAPTER I. THE FOUNDING OF THE NATION	1	CHAPTER II. THE EARLY YEARS OF THE REPUBLIC	15
CHAPTER III. THE GROWTH OF THE UNION	30	CHAPTER IV. THE STRUGGLE FOR SLAVERY	45
CHAPTER V. THE CIVIL WAR	60	CHAPTER VI. THE RECONSTRUCTION	75
CHAPTER VII. THE GROWTH OF THE UNION	90	CHAPTER VIII. THE STRUGGLE FOR SLAVERY	105
CHAPTER IX. THE CIVIL WAR	120	CHAPTER X. THE RECONSTRUCTION	135
CHAPTER XI. THE GROWTH OF THE UNION	150	CHAPTER XII. THE STRUGGLE FOR SLAVERY	165
CHAPTER XIII. THE CIVIL WAR	180	CHAPTER XIV. THE RECONSTRUCTION	195
CHAPTER XV. THE GROWTH OF THE UNION	210	CHAPTER XVI. THE STRUGGLE FOR SLAVERY	225
CHAPTER XVII. THE CIVIL WAR	240	CHAPTER XVIII. THE RECONSTRUCTION	255
CHAPTER XIX. THE GROWTH OF THE UNION	270	CHAPTER XX. THE STRUGGLE FOR SLAVERY	285
CHAPTER XXI. THE CIVIL WAR	300	CHAPTER XXII. THE RECONSTRUCTION	315
CHAPTER XXIII. THE GROWTH OF THE UNION	330	CHAPTER XXIV. THE STRUGGLE FOR SLAVERY	345
CHAPTER XXV. THE CIVIL WAR	360	CHAPTER XXVI. THE RECONSTRUCTION	375
CHAPTER XXVII. THE GROWTH OF THE UNION	390	CHAPTER XXVIII. THE STRUGGLE FOR SLAVERY	405
CHAPTER XXIX. THE CIVIL WAR	420	CHAPTER XXX. THE RECONSTRUCTION	435
CHAPTER XXXI. THE GROWTH OF THE UNION	450	CHAPTER XXXII. THE STRUGGLE FOR SLAVERY	465
CHAPTER XXXIII. THE CIVIL WAR	480	CHAPTER XXXIV. THE RECONSTRUCTION	495
CHAPTER XXXV. THE GROWTH OF THE UNION	510	CHAPTER XXXVI. THE STRUGGLE FOR SLAVERY	525
CHAPTER XXXVII. THE CIVIL WAR	540	CHAPTER XXXVIII. THE RECONSTRUCTION	555
CHAPTER XXXIX. THE GROWTH OF THE UNION	570	CHAPTER XL. THE STRUGGLE FOR SLAVERY	585
CHAPTER XLI. THE CIVIL WAR	600	CHAPTER XLII. THE RECONSTRUCTION	615
CHAPTER XLIII. THE GROWTH OF THE UNION	630	CHAPTER XLIV. THE STRUGGLE FOR SLAVERY	645
CHAPTER XLV. THE CIVIL WAR	660	CHAPTER XLVI. THE RECONSTRUCTION	675
CHAPTER XLVII. THE GROWTH OF THE UNION	690	CHAPTER XLVIII. THE STRUGGLE FOR SLAVERY	705
CHAPTER XLIX. THE CIVIL WAR	720	CHAPTER L. THE RECONSTRUCTION	735
CHAPTER LI. THE GROWTH OF THE UNION	750	CHAPTER LII. THE STRUGGLE FOR SLAVERY	765
CHAPTER LIII. THE CIVIL WAR	780	CHAPTER LIV. THE RECONSTRUCTION	795
CHAPTER LV. THE GROWTH OF THE UNION	810	CHAPTER LVI. THE STRUGGLE FOR SLAVERY	825
CHAPTER LVII. THE CIVIL WAR	840	CHAPTER LVIII. THE RECONSTRUCTION	855
CHAPTER LIX. THE GROWTH OF THE UNION	870	CHAPTER LX. THE STRUGGLE FOR SLAVERY	885
CHAPTER LXI. THE CIVIL WAR	900	CHAPTER LXII. THE RECONSTRUCTION	915
CHAPTER LXIII. THE GROWTH OF THE UNION	930	CHAPTER LXIV. THE STRUGGLE FOR SLAVERY	945
CHAPTER LXV. THE CIVIL WAR	960	CHAPTER LXVI. THE RECONSTRUCTION	975
CHAPTER LXVII. THE GROWTH OF THE UNION	990	CHAPTER LXVIII. THE STRUGGLE FOR SLAVERY	1005
CHAPTER LXIX. THE CIVIL WAR	1020	CHAPTER LXX. THE RECONSTRUCTION	1035
CHAPTER LXXI. THE GROWTH OF THE UNION	1050	CHAPTER LXXII. THE STRUGGLE FOR SLAVERY	1065
CHAPTER LXXIII. THE CIVIL WAR	1080	CHAPTER LXXIV. THE RECONSTRUCTION	1095
CHAPTER LXXV. THE GROWTH OF THE UNION	1110	CHAPTER LXXVI. THE STRUGGLE FOR SLAVERY	1125
CHAPTER LXXVII. THE CIVIL WAR	1140	CHAPTER LXXVIII. THE RECONSTRUCTION	1155
CHAPTER LXXIX. THE GROWTH OF THE UNION	1170	CHAPTER LXXX. THE STRUGGLE FOR SLAVERY	1185
CHAPTER LXXXI. THE CIVIL WAR	1200	CHAPTER LXXXII. THE RECONSTRUCTION	1215
CHAPTER LXXXIII. THE GROWTH OF THE UNION	1230	CHAPTER LXXXIV. THE STRUGGLE FOR SLAVERY	1245
CHAPTER LXXXV. THE CIVIL WAR	1260	CHAPTER LXXXVI. THE RECONSTRUCTION	1275
CHAPTER LXXXVII. THE GROWTH OF THE UNION	1290	CHAPTER LXXXVIII. THE STRUGGLE FOR SLAVERY	1305
CHAPTER LXXXIX. THE CIVIL WAR	1320	CHAPTER LXXXX. THE RECONSTRUCTION	1335
CHAPTER LXXXXI. THE GROWTH OF THE UNION	1350	CHAPTER LXXXXII. THE STRUGGLE FOR SLAVERY	1365
CHAPTER LXXXXIII. THE CIVIL WAR	1380	CHAPTER LXXXXIV. THE RECONSTRUCTION	1395
CHAPTER LXXXXV. THE GROWTH OF THE UNION	1410	CHAPTER LXXXXVI. THE STRUGGLE FOR SLAVERY	1425
CHAPTER LXXXXVII. THE CIVIL WAR	1440	CHAPTER LXXXXVIII. THE RECONSTRUCTION	1455
CHAPTER LXXXXIX. THE GROWTH OF THE UNION	1470	CHAPTER LXXXXX. THE STRUGGLE FOR SLAVERY	1485
CHAPTER LXXXXXI. THE CIVIL WAR	1500	CHAPTER LXXXXXII. THE RECONSTRUCTION	1515
CHAPTER LXXXXXIII. THE GROWTH OF THE UNION	1530	CHAPTER LXXXXXIV. THE STRUGGLE FOR SLAVERY	1545
CHAPTER LXXXXXV. THE CIVIL WAR	1560	CHAPTER LXXXXXVI. THE RECONSTRUCTION	1575
CHAPTER LXXXXXVII. THE GROWTH OF THE UNION	1590	CHAPTER LXXXXXVIII. THE STRUGGLE FOR SLAVERY	1605
CHAPTER LXXXXXIX. THE CIVIL WAR	1620	CHAPTER LXXXXXX. THE RECONSTRUCTION	1635
CHAPTER LXXXXXXI. THE GROWTH OF THE UNION	1650	CHAPTER LXXXXXXII. THE STRUGGLE FOR SLAVERY	1665
CHAPTER LXXXXXXIII. THE CIVIL WAR	1680	CHAPTER LXXXXXXIV. THE RECONSTRUCTION	1695
CHAPTER LXXXXXXV. THE GROWTH OF THE UNION	1710	CHAPTER LXXXXXXVI. THE STRUGGLE FOR SLAVERY	1725
CHAPTER LXXXXXXVII. THE CIVIL WAR	1740	CHAPTER LXXXXXXVIII. THE RECONSTRUCTION	1755
CHAPTER LXXXXXXIX. THE GROWTH OF THE UNION	1770	CHAPTER LXXXXXXX. THE STRUGGLE FOR SLAVERY	1785
CHAPTER LXXXXXXXI. THE CIVIL WAR	1800	CHAPTER LXXXXXXXII. THE RECONSTRUCTION	1815
CHAPTER LXXXXXXXIII. THE GROWTH OF THE UNION	1830	CHAPTER LXXXXXXXIV. THE STRUGGLE FOR SLAVERY	1845
CHAPTER LXXXXXXXV. THE CIVIL WAR	1860	CHAPTER LXXXXXXXVI. THE RECONSTRUCTION	1875

ACCESSION NUMBER INDEX

W77-03076	3A	W77-03154	10C	W77-03232	5B	W77-03310	5G
W77-03077	5C	W77-03155	2D	W77-03233	2L	W77-03311	2C
W77-03078	5C	W77-03156	5D	W77-03234	5B	W77-03312	2L
W77-03079	5D	W77-03157	6B	W77-03235	5B	W77-03313	2F
W77-03080	8B	W77-03158	5D	W77-03236	5B	W77-03314	4C
W77-03081	8B	W77-03159	6A	W77-03237	5A	W77-03315	2G
W77-03082	8B	W77-03160	2I	W77-03238	5B	W77-03316	4D
W77-03083	8B	W77-03161	5C	W77-03239	5B	W77-03317	8B
W77-03084	8B	W77-03162	5D	W77-03240	5B	W77-03318	8B
W77-03085	8B	W77-03163	5D	W77-03241	5B	W77-03319	2E
W77-03086	2A	W77-03164	2F	W77-03242	5B	W77-03320	2G
W77-03087	2L	W77-03165	9D	W77-03243	2L	W77-03321	2G
W77-03088	2L	W77-03166	10C	W77-03244	5B	W77-03322	2L
W77-03089	2L	W77-03167	5B	W77-03245	2L	W77-03323	2L
W77-03090	2L	W77-03168	5G	W77-03246	2L	W77-03324	2L
W77-03091	2L	W77-03169	2D	W77-03247	2C	W77-03325	2L
W77-03092	5B	W77-03170	5C	W77-03248	2L	W77-03326	7C
W77-03093	5C	W77-03171	5B	W77-03249	2L	W77-03327	7C
W77-03094	5C	W77-03172	3F	W77-03250	2L	W77-03328	7C
W77-03095	2J	W77-03173	4C	W77-03251	2L	W77-03329	2F
W77-03096	2B	W77-03174	4A	W77-03252	2C	W77-03330	7C
W77-03097	5B	W77-03175	4A	W77-03253	5B	W77-03331	2F
W77-03098	5A	W77-03176	4A	W77-03254	2L	W77-03332	2L
W77-03099	7B	W77-03177	4A	W77-03255	2L	W77-03333	7C
W77-03100	2C	W77-03178	4A	W77-03256	2L	W77-03334	8B
W77-03101	2B	W77-03179	4A	W77-03257	2L	W77-03335	4B
W77-03102	8D	W77-03180	4A	W77-03258	2L	W77-03336	2F
W77-03103	2H	W77-03181	4A	W77-03259	2L	W77-03337	4A
W77-03104	8B	W77-03182	4A	W77-03260	2L	W77-03338	4B
W77-03105	8B	W77-03183	4A	W77-03261	5B	W77-03339	7B
W77-03106	5G	W77-03184	5C	W77-03262	2C	W77-03340	4B
W77-03107	5A	W77-03185	5A	W77-03263	5C	W77-03341	7C
W77-03108	8D	W77-03186	5C	W77-03264	2L	W77-03342	2K
W77-03109	2F	W77-03187	5C	W77-03265	7C	W77-03343	5A
W77-03110	7C	W77-03188	5B	W77-03266	2L	W77-03344	7B
W77-03111	7B	W77-03189	5C	W77-03267	5C	W77-03345	4B
W77-03112	8D	W77-03190	5B	W77-03268	2C	W77-03346	2E
W77-03113	5A	W77-03191	5B	W77-03269	2C	W77-03347	4B
W77-03114	4A	W77-03192	5C	W77-03270	2C	W77-03348	7C
W77-03115	5B	W77-03193	5C	W77-03271	2L	W77-03349	4A
W77-03116	5D	W77-03194	5C	W77-03272	2C	W77-03350	7C
W77-03117	5B	W77-03195	5C	W77-03273	2C	W77-03351	5A
W77-03118	2D	W77-03196	5C	W77-03274	2C	W77-03352	5D
W77-03119	5C	W77-03197	5C	W77-03275	2C	W77-03353	5D
W77-03120	3B	W77-03198	5C	W77-03276	2C	W77-03354	5C
W77-03121	6B	W77-03199	5C	W77-03277	7B	W77-03355	5B
W77-03122	2F	W77-03200	5C	W77-03278	6D	W77-03356	5D
W77-03123	5B	W77-03201	5C	W77-03279	2K	W77-03357	5G
W77-03124	2G	W77-03202	5A	W77-03280	2G	W77-03358	5B
W77-03125	5B	W77-03203	5C	W77-03281	2G	W77-03359	5B
W77-03126	4D	W77-03204	5C	W77-03282	5D	W77-03360	5A
W77-03127	2B	W77-03205	5C	W77-03283	2K	W77-03361	5B
W77-03128	5D	W77-03206	9D	W77-03284	2H	W77-03362	5A
W77-03129	4A	W77-03207	5B	W77-03285	2H	W77-03363	5D
W77-03130	5D	W77-03208	2H	W77-03286	2K	W77-03364	5D
W77-03131	5B	W77-03209	5C	W77-03287	2H	W77-03365	5D
W77-03132	5D	W77-03210	5C	W77-03288	6E	W77-03366	5C
W77-03133	5B	W77-03211	6C	W77-03289	5D	W77-03367	5D
W77-03134	5B	W77-03212	3B	W77-03290	3A	W77-03368	5D
W77-03135	3F	W77-03213	3B	W77-03291	5A	W77-03369	5D
W77-03136	2I	W77-03214	3B	W77-03292	5B	W77-03370	5C
W77-03137	3F	W77-03215	3B	W77-03293	2L	W77-03371	5C
W77-03138	2I	W77-03216	3F	W77-03294	8B	W77-03372	5A
W77-03139	4D	W77-03217	5C	W77-03295	8F	W77-03373	5B
W77-03140	2I	W77-03218	5C	W77-03296	2C	W77-03374	5C
W77-03141	2D	W77-03219	5A	W77-03297	8B	W77-03375	5B
W77-03142	2D	W77-03220	5A	W77-03298	2J	W77-03376	5C
W77-03143	3F	W77-03221	5B	W77-03299	3B	W77-03377	5C
W77-03144	5C	W77-03222	5B	W77-03300	2L	W77-03378	5G
W77-03145	2L	W77-03223	5C	W77-03301	2C	W77-03379	5A
W77-03146	4B	W77-03224	5B	W77-03302	8I	W77-03380	5C
W77-03147	5D	W77-03225	5C	W77-03303	3B	W77-03381	5C
W77-03148	2I	W77-03226	5B	W77-03304	2L	W77-03382	5B
W77-03149	5D	W77-03227	5B	W77-03305	5A	W77-03383	5G
W77-03150	5A	W77-03228	2L	W77-03306	5G	W77-03384	5C
W77-03151	4A	W77-03229	5C	W77-03307	5G	W77-03385	5B
W77-03152	5D	W77-03230	6G	W77-03308	5G	W77-03386	5C
W77-03153	5D	W77-03231	5B	W77-03309	5G	W77-03387	2L

ACCESSION NUMBER INDEX

W77-03388

W77-03388	5B	W77-03467	5A	W77-03546	5G
W77-03389	5C	W77-03468	5A	W77-03547	6B
W77-03390	2H	W77-03469	5D	W77-03548	4B
W77-03391	5B	W77-03470	5A	W77-03549	6B
W77-03392	5C	W77-03471	5A	W77-03550	4A
W77-03393	5C	W77-03472	5A	W77-03551	6B
W77-03394	3F	W77-03473	5D	W77-03552	4A
W77-03395	2G	W77-03474	5A	W77-03553	6D
W77-03396	2G	W77-03475	3B	W77-03554	3F
W77-03397	8C	W77-03476	5B	W77-03555	4B
W77-03398	8G	W77-03477	5B	W77-03556	5B
W77-03399	8G	W77-03478	5A	W77-03557	6G
W77-03400	8G	W77-03479	5G	W77-03558	6B
W77-03401	5D	W77-03480	5D	W77-03559	6B
W77-03402	5D	W77-03481	5B	W77-03560	6D
W77-03403	5D	W77-03482	5D	W77-03561	6B
W77-03404	5D	W77-03483	5G	W77-03562	6B
W77-03405	5D	W77-03484	5A	W77-03563	5D
W77-03406	5D	W77-03485	5C	W77-03564	6G
W77-03407	5D	W77-03486	5D	W77-03565	5A
W77-03408	5D	W77-03487	5D	W77-03566	6G
W77-03409	5D	W77-03488	5D	W77-03567	5B
W77-03410	5D	W77-03489	5D	W77-03568	5D
W77-03411	5D	W77-03490	6E	W77-03569	5D
W77-03412	5D	W77-03491	6E	W77-03570	5D
W77-03413	5D	W77-03492	6E	W77-03571	5D
W77-03414	5D	W77-03493	6E	W77-03572	5D
W77-03415	5D	W77-03494	6E	W77-03573	5D
W77-03416	5D	W77-03495	6E	W77-03574	5D
W77-03417	5D	W77-03496	6E	W77-03575	5D
W77-03418	5D	W77-03497	6E	W77-03576	5D
W77-03419	5E	W77-03498	6E	W77-03577	5D
W77-03420	5D	W77-03499	6E	W77-03578	3E
W77-03421	5D	W77-03500	6E	W77-03579	5D
W77-03422	5D	W77-03501	6E	W77-03580	5D
W77-03423	5D	W77-03502	6E	W77-03581	5D
W77-03424	5E	W77-03503	6E	W77-03582	6B
W77-03425	5D	W77-03504	6E	W77-03583	6E
W77-03426	5D	W77-03505	6E	W77-03584	6E
W77-03427	5D	W77-03506	6E	W77-03585	6E
W77-03428	5D	W77-03507	6E	W77-03586	5B
W77-03429	5D	W77-03508	6E	W77-03587	5G
W77-03430	5D	W77-03509	6E	W77-03588	5G
W77-03431	5D	W77-03510	6E	W77-03589	5A
W77-03432	5D	W77-03511	6E	W77-03590	6G
W77-03433	5D	W77-03512	6E	W77-03591	6E
W77-03434	5D	W77-03513	6E	W77-03592	2B
W77-03435	5D	W77-03514	6E	W77-03593	4A
W77-03436	5D	W77-03515	6E	W77-03594	5G
W77-03437	5D	W77-03516	6E	W77-03595	5C
W77-03438	8C	W77-03517	6E	W77-03596	5G
W77-03439	5F	W77-03518	6E	W77-03597	2H
W77-03440	5D	W77-03519	6E	W77-03598	6E
W77-03441	5D	W77-03520	6E	W77-03599	6E
W77-03442	5D	W77-03521	6E	W77-03600	5G
W77-03443	5D	W77-03522	6F		
W77-03444	5D	W77-03523	6A		
W77-03445	5D	W77-03524	6A		
W77-03446	5D	W77-03525	6B		
W77-03447	5D	W77-03526	5G		
W77-03448	5C	W77-03527	5G		
W77-03449	5D	W77-03528	5G		
W77-03450	5D	W77-03529	5G		
W77-03451	2G	W77-03530	5G		
W77-03452	5D	W77-03531	5G		
W77-03453	5D	W77-03532	6E		
W77-03454	5A	W77-03533	6E		
W77-03455	5D	W77-03534	5G		
W77-03456	5D	W77-03535	6E		
W77-03457	5A	W77-03536	5C		
W77-03458	5A	W77-03537	5C		
W77-03459	5F	W77-03538	5C		
W77-03460	5A	W77-03539	5B		
W77-03461	5D	W77-03540	5B		
W77-03462	5A	W77-03541	5B		
W77-03463	5A	W77-03542	6D		
W77-03464	5D	W77-03543	6E		
W77-03465	5A	W77-03544	6B		
W77-03466	5A	W77-03545	6B		

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W77-03216 03394--03396	4
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-03351--03369 03397--03450 03452--03474 03476--03480 03482--03487 03489 03567--03581	123
Illinois State Water Survey, Hydrology	W77-03081--03106 03108--03112 03114--03115 03291--03305 03307--03325	67
University of Arizona, Arid Land Water Resources	W77-03135--03143 03146	10
University of Florida, Eastern U. S. Water Law	W77-03490--03535 03582--03585 03587--03588 03590--03591 03593--03594 03596 03598--03600	60
University of North Carolina, Metropolitan Water Resources Planning and Management	W77-03174--03183	10
University of Wisconsin, Eutrophication	W77-03370--03393 03536--03540	29
University of Wisconsin, Water Resources Economics	W77-03542--03566	25

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-03077--03080 03116 03119--03123 03126--03127 03129--03130 03132, 03147 03149--03154 03156--03160 03162--03170 03172 03209--03211 03288--03289	42
C. OTHER		
BioSciences Information Service	W77-03107, 03113 03117--03118 03124--03125 03128, 03131 03134 03144--03145 03148--03155 03161 03200--03201 03306, 03451 03475, 03481 03488, 03541 03586, 03589 03592, 03595 03597	27
Bureau of Reclamation	W77-03212--03215	4
Commonwealth Scientific and Industrial Research Organization, Australia	W77-03278--03287	10
Biological Consultant and Information Services (Effects of Pollutants on Aquatic Life)	W77-03184--03199 03202--03205	20

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER (CONTINUED)		
Forest Service (USDA)	W77-03173	1
Ocean Engineering Information Service (Outer Continental Shelf)	W77-03217--03277	61
Office of Water Research and Technology	W77-03076, 03133 03171 03206--03208 03290	7
U. S. Geological Survey	W77-03326--03350	25

